FACTORY

MANAGEMENT AND MAINTENANCE

JUNE 1949

SPECIAL REPORTS	Bear Down on Production Costs *2. Tell Employees Why Costs Must Be Cut*	66
	What the Hoover Report Means to Industry	110
EDITORIAL	Employee Communication—Difficult, But Vital	65
PRODUCTION	Seven Power-and-Free Conveyors Mechanize Job-Shop Foundry	80
	Memomotion Study Technique Simplifies Work Analysis	84
	New Plant Expands Capacity in One-Third Less Floor Space	86
	Extension Shoes Help Straddle Trucks Carry Bigger Loads	106
	More Speed, More Space—With Mechanized Shipping Layout	114
	Using Control Reports to Improve Incentive Administration	117
	Simplified Stock and Accounting Control in a Small Plant	122
MAINTENANCE	Maintenance During Vacation Costs 60 Per Cent Less	88
	How to Dispose of Fluorescent Lamps Safely	93
	Good Power Plants Can Generate Big Savings	94
	Electric Motor Controls—*Plant Operation Library No. 120*	95
	This Maintenance Program Limits Delays to Three Minutes	108
	A Guide to Good Use of Color in Painting the Plant	124
INDUSTRIAL RELATIONS	Industrial Engineering—a Survey of Practice in 89 Plants	90
	A Four-Week Training Program in Quality and Methods	120
	Office Girls Learn Steel Making	128
	Closed Shop *vs* Union Shop *vs* Dues Shop—*Management Data Sheet*	138
	See also SPECIAL REPORTS above	
DEPARTMENTS	Looking Ahead in Labor, 129 • Looking Ahead in Business, 130 • Operating Shorts, 132 • What's New in Equipment, 140 • You Want to Know, 218 • Significant Labor Developments, 226 • They Say and Do, 242 • Behind the Byline, 248 • Books and Booklets, 254 • On the Calendar, 258 • Catalog Service, 264	

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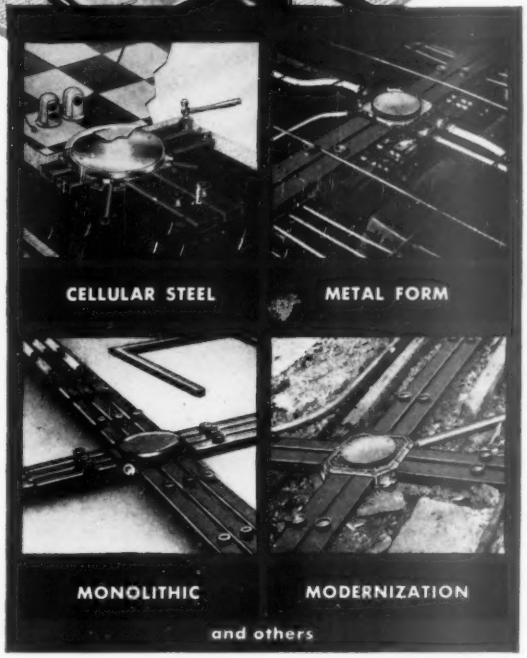

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MANAGEMENT and MAINTENANCE

JUNE, 1949

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Factory Management and Maintenance, June, 1949. Vol. 107, No. 6. Published monthly. McGraw-Hill Publishing Co., Inc., Address all communications to the editorial, executive and circulation offices, 330 West 42nd Street, New York 18, N. Y. Entered as second-class matter July 22, 1948, at the post office at New York, N. Y., under the Act of March 3, 1879.

Factory Management and Maintenance is a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering. Subscription rates—United States, U. S. Possessions: $3, 1 year; $4, 2 years; $5, 3 years. Canada: $4, 1 year; $6, 2 years; $8, 3 years. Pan-American countries: $6, 1 year; $10, 2 years; $12, 3 years. Other countries: $15, 1 year; $25, 2 years; $30, 3 years. Single copies, 35c; in Latin America, 75c; in all other countries, $1.50. Factory Management and Maintenance solicits subscriptions only from production, maintenance, and management executives and engineers in manufacturing plants. Please indicate company connection and title on all subscription orders. Cable address, "McGraw-Hill, New York." Member A.B.P., Member A.B.C. Copyright 1949 by McGraw-Hill Publishing Co., Inc. All rights reserved.

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MAINTENANCE

Maintenance During Vacation Costs 60 Per Cent Less . . . 88
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Management Data Sheet 138
See also SPECIAL REPORTS above

DEPARTMENTS

Looking Ahead in Labor . 129
Looking Ahead in Business 130
Operating Shorts 132
What's New In Equipment 140
You Want to Know . . . 218
Labor Developments . . . 226
They Say and Do 242
Behind the Byline . . . 248
Books and Booklets . . . 254
On the Calendar 258
Catalog Service 264

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At the H & D Package Laboratory, leather and wood and linen patterns are often simulated in corrugated board. Distributors of specialty items, are capitalizing on H & D ingenuity and craftsmanship to sell merchandise. Relatively inexpensive, distinctive in appearance, rugged in construction, these H & D corrugated boxes are a complement to the highest quality products.

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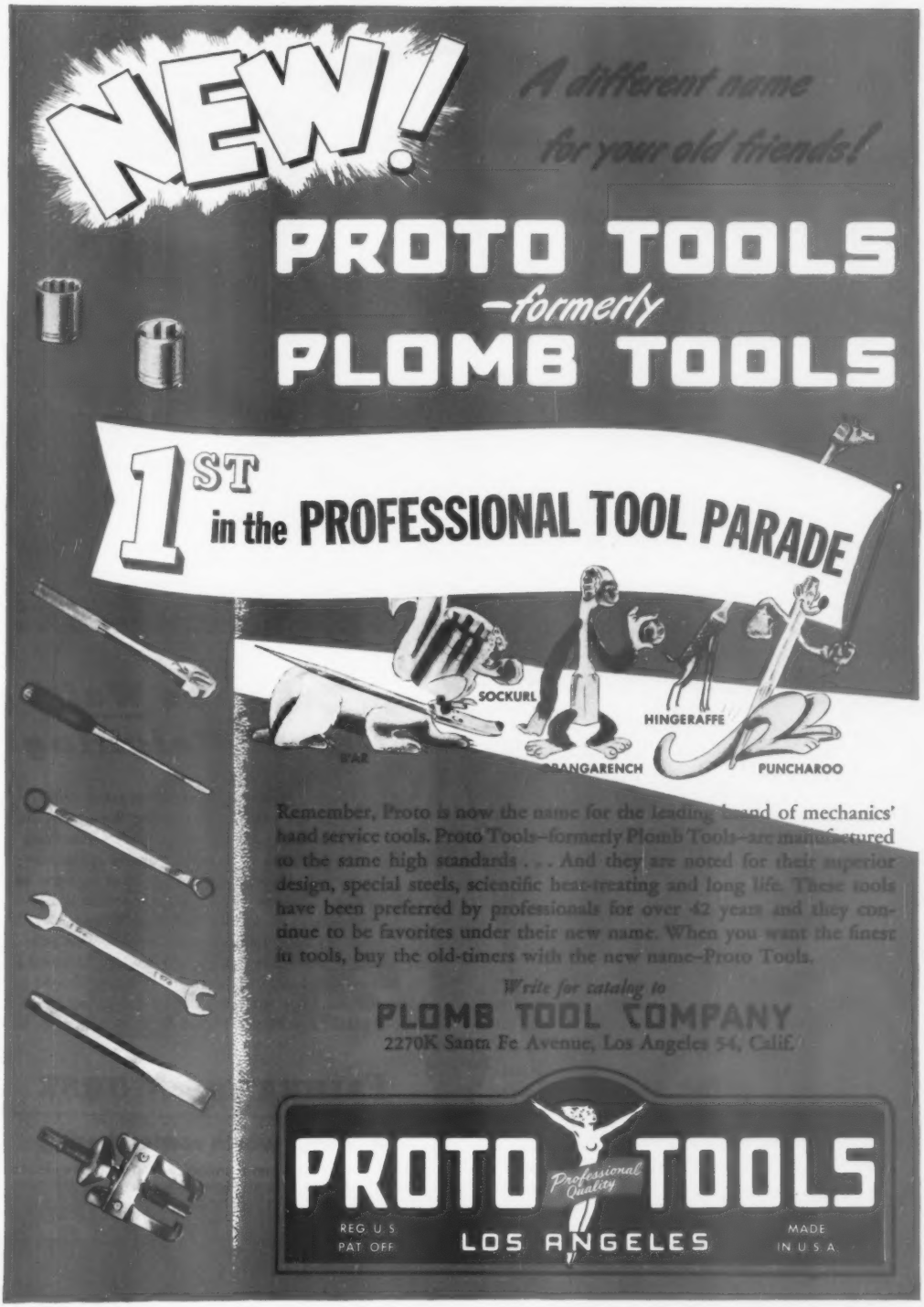
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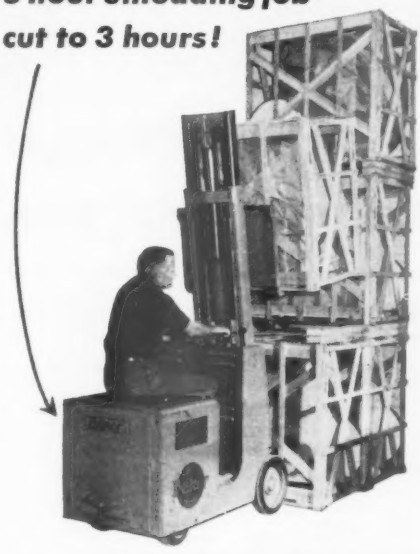

The same Baker Truck unloaded and tiered a car of 74 crated electric appliances, weighing 275 lbs. each, in 3 hours. This job formerly took 3 men 8 hours.

Typical of the savings possible with a low-cost, light-weight BAKER FQH Fork Truck are these made by a prominent Southern utility. In addition to the operations illustrated, the truck is used for unloading, warehouse handling and loading of a complete line of major appliances, coils of wire, insulators, pole line hardware, etc. The truck will also be used for handling transformers between the warehouse and a transformer storage and testing shop to be erected. It is estimated that this truck will pay for itself in savings within 18 months.

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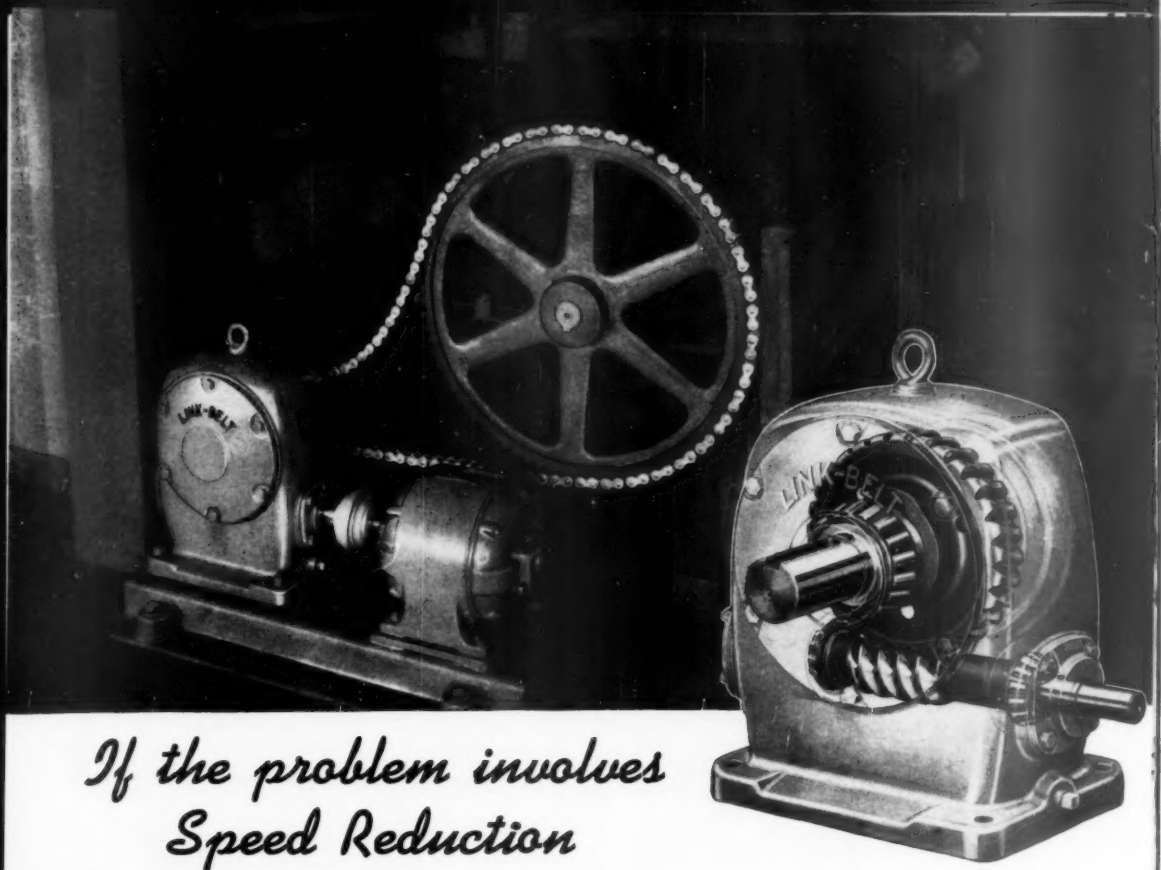

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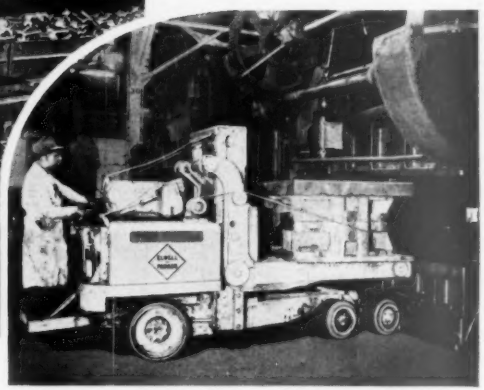

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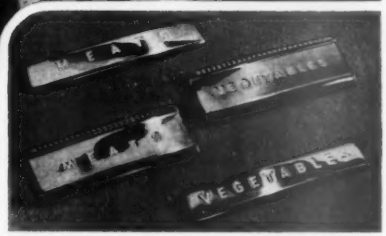

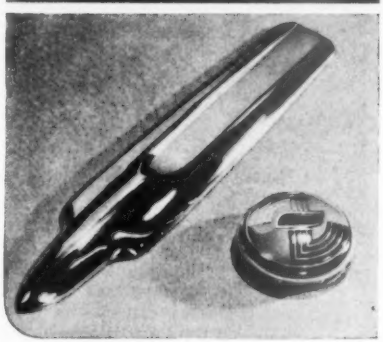

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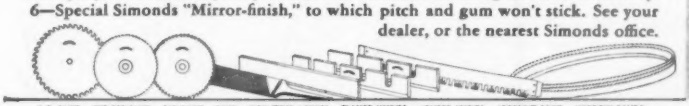

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RUNS ALL DAY FOR 22¢*

Saves You HALF In Moving and Stacking any Product

LOW ORIGINAL INVESTMENT

NO COSTLY REPLACEMENT EXPENSE

Everyone knows the famous Automatic TRANSTACKER . . . the high lift stacker that moves, lifts and stacks material with "touch of your thumb" ease.

Now, for the first time, you get all the benefits of this miracle truck, but with the added advantage that you drive it like an automobile. Operator sits comfortably on the TRANSRIDER . . . does your material handling with utter ease, lifting, tilting and driving.

With a telescopic lift mechanism, the Transrider raises load to 130 inches, with an overall height of only 83 inches for clearance through standard boxcar and factory doors. Single lift, before telescopic uprights are extended, is 66 inches.

The shortest of any truck of like capacity, Transrider is maneuverable in cramped working quarters. Carrying a 36-inch load, it can right-angle stack in nine-foot aisles. This means added storage space within present building capacities. Truck capacities range from 2000 pounds for 48-inch long load to 3000 pounds for a 28-inch load.

It does all this for as little as *22c a day battery charging cost . . . with maintenance cost, like the famed Transporter, exceedingly low!

At Transrider's new, low cost, every business now can use modern, money-saving material handling methods! Mail coupon for complete facts.

USERS SAVE THOUSANDS OF DOLLARS

New Tilting Type TRANSTACKER . . .

This is the famous Transtacker you walk with . . . and now made ever more efficient with new tilting uprights that cradle the load for easier, faster spotting of loads, and maximum protection for both operator and merchandise.

High pressure hydraulic single or telescopic lift stacks your product to new heights, to increase storage capacity. Finger-tip control lifts a 36-inch, 2500-pound load, or a 48-inch, 2000-pound load in a matter of seconds. Transtacker also operates on standard batteries, and chargers, interchangeable with the Automatic Transporter. Mail coupon.

MAIL COUPON FOR FREE CATALOG

Transrider Stacker

A PRODUCT OF AUTOMATIC

Lightens LIFE'S LOADS

AUTOMATIC TRANSPORTATION COMPANY

DIV. OF THE VALE & TOWNE MFG. CO.

39 West 87th Street, Dept. F-7 Chicago 20, Ill.

Please send me catalog and complete facts on the new, low-priced

☐ TRANSRIDER

☐ TILTING TYPE TRANSTACKER

Company Name.....

By.....*Position*.....

Street Address.....

City.....*Zone*.....*State*.....

MANUFACTURERS OF THE FAMOUS TRANSPORTERS, TRANSTACKERS AND SKYLIFT ELECTRIC TRUCKS

Prime dividend-payers

in performance, reliability, long service life!

TYPE GL-880
Power triode for both dielectric and induction heating. Single-tube equipment rating, 20 kw.

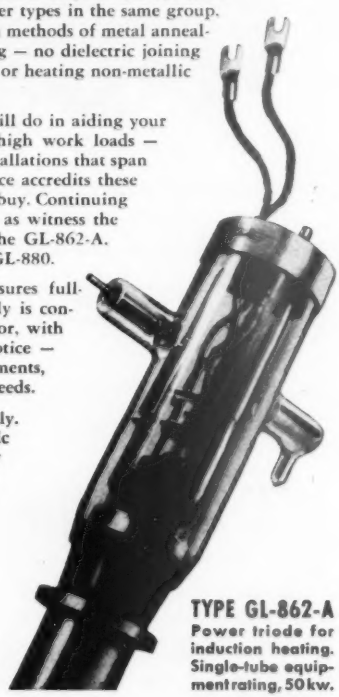
"WHEN YOU REPLACE WITH GENERAL ELECTRIC H-F-HEATING TUBES, YOU MAKE A WISE INVESTMENT TOWARD HIGH PLANT PRODUCTION"

THESE power tubes are the "big boys" that supply high-frequency current for electronic-heating processes in your factory. Without them and smaller types in the same group, there would be no fast induction methods of metal annealing, surface-hardening, or brazing — no dielectric joining of plastic parts, bonding plywood, or heating non-metallic substances instantly.

What the GL-880 and GL-862-A will do in aiding your production — day-in, day-out, under high work loads — they already have achieved in heater installations that span industry. A long history of staunch service accredits these tubes as the best, most dependable you can buy. Continuing refinements make them ever more efficient, as witness the improved cooling of the cathode stem on the GL-862-A, and the new self-sealing water-jacket on the GL-880.

General Electric's tube warranty further assures full-measure performance. And your source of supply is conveniently near you: your local G-E tube distributor, with the right tubes on hand or available on brief notice — anxious to serve you — experienced in tube replacements, so able to offer you useful advice on your plant's needs.

Study your h-f-heating tube requirements regularly. Check them today! . . . Then phone your General Electric tube distributor for a 100-percent *proved product*, built by the leader in industrial-tube manufacture. *Electronics Dept., General Electric Company, Schenectady 5, N. Y.*



TYPE GL-862-A
Power triode for induction heating. Single-tube equipment rating, 50 kw.

You can put your confidence in—

GENERAL ELECTRIC

180-HA20

ONCE again the many ways in which workers and management alike are benefited by Pittsburgh COLOR DYNAMICS are demonstrated in the plant of McDonnell & Miller, Inc., of Chicago, Ill. This organization is well-known for its specialization in the manufacture of boiler water-level controls and equipment.

Experiences of this company with COLOR DYNAMICS, Pittsburgh's scientific painting system based upon the principles of the *energy in color*, are summarized in this letter from Leo J. Kmiecik, Vice-President in Charge of Manufacturing.

"Because of our interest in what we in plant management call 'good housekeeping,'" writes Mr. Kmiecik, "after consulting with your representative we decided to give all machine tools in our Tool Section the 'COLOR DYNAMICS treatment.'

"Painting in the toolroom was hardly completed before the men in other divisions asked that we paint their departments in similar manner. As a result, our entire plant has been painted according to COLOR DYNAMICS with marvelous results.

"Morale of workers was greatly improved. For one thing, eye-strain among them was immediately relieved. They also take a far greater pride in keeping machines cleaned. We have also noticed that their personal appearance has improved.

"Yes, we are very much 'sold' on the results obtained from our nominal investment in COLOR DYNAMICS and we'll be glad to show our plant to anyone interested in seeing what we have done."

Your plant may need Pittsburgh COLOR DYNAMICS. Why not test the value of this painting method by applying it on a machine or two—or in a complete department? We'll be glad to make a COLOR DYNAMICS survey of your property on request without obligations on your part.

There's a Pittsburgh Paint For Every Painting Need

WALLHIDE—available in four types: **FLAT**—a velvet-like finish that is beautiful and restful; **SEMI-GLOSS**—with higher sheen; **GLOSS**—with enamel-like sheen; **PBX**—extra-durable finish can be washed frequently.

•

LAVAX PBX ENAMEL—for woodwork, furniture or metal trim. Brushes out freely and easily to a smooth, satin finish.

•

LAVAX MACHINERY ENAMEL—a durable finish impervious to grease, grime or dirt.

•

FLORHIDE—for floor surfaces. Quick-drying, tough, can be scrubbed with soap solutions.

SEND FOR A COPY OF THIS BOOK!

Pittsburgh Plate Glass Co., Paint Div., Department FAG-49, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your new revised and enlarged Booklet "*Color Dynamics In Industry.*"

☐ Please have your representative call for a Color Dynamics Survey of our property without obligation on our part.

Name _____

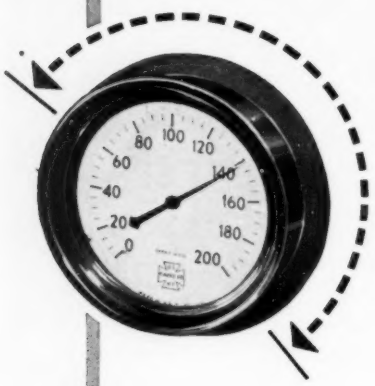
Street _____

City _____ County _____ State _____

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY



safely CAN YOU WORK YOUR DRIER ROLLS AT Higher Steam Pressures?

Production increases up to 60% have been reported after Lukenweld Jacketed Steel Drier Rolls, operating at elevated temperatures, have been installed.

High pressures, possible with Lukenweld Rolls, boost output

First question to ask is, "Can our old rolls be *safely* worked at higher pressures?" Some operators report unfortunate experiences when they tried; failure of rolls damaged other rolls and shut down entire machines. Often the insurance companies will not permit any increase in pressure.

Lukenweld Drier Rolls are predictable, because they are steel plate construction. Designed for pressure work—as much as 350 psi. and over—they are SAFE. Ask your insurance company what they know about Lukenweld Drier Rolls.

Positive removal of condensate and the higher steam velocity obtained with Lukenweld Jacketed Drier Rolls make them better workers at any steam pressure. Reduction of film, dead steam, entrapped air or other noncondensable gases contributes to their high efficiency. Temperatures are more even across roll faces.

Lukenweld Jacketed Drier Rolls are offered in diameters from two feet to over twenty feet. They are described in Bulletin 358. For a copy, write Lukenweld, Division of Lukens Steel Company, 421 Lukens Bldg., Coatesville, Pa.

We'll lend you "LUKENWELD", a 16mm motion picture with sound, highlighting our methods, facilities and products. Running time: 20 minutes. Write for booking date.

LUKENS
LUKENWELD DIVISION

DESIGNERS, ENGINEERS AND MANUFACTURERS OF MACHINERY

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

FOR A SHARPER IMAGE OF

TOP PROFITS IN TELEVISION PRODUCTION and SALES

. . . set-builders use

AMERICAN PHILLIPS SCREWS

SEE NEW PRODUCTION PROFITS: Assembly of costly television sets puts a prohibition on spoilage. That's why American Phillips Screws are used, to help keep sets rolling out to an eager market, and to keep rejections down. No delays or losses, then, and output hits the main channel with highest return per man-hour, *which means time-savings up to 50%!*

SEE NEW SALES-STIMULATION: Smoothly finished, unmarred cabinet work is the basis of television-set sales. And that's the way sets come from an assembly department using *American Phillips Screws.*

Does YOUR product have this double-feature of production-economy and sales promotion? Then write:

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

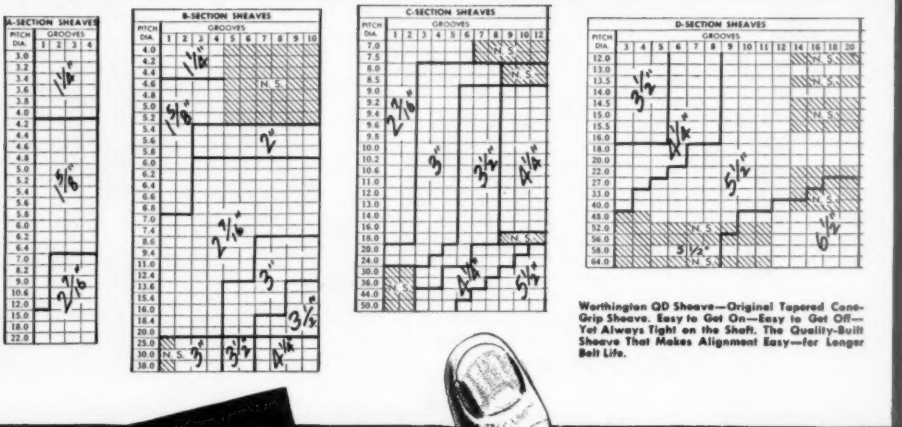
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

THE GOOD RIGHT HAND OF INDUSTRY



Worthington QD Sheave—Original Tapered Cone-Grip Sheave. Easy to Get On—Easy to Get Off—Yet Always Tight on the Shaft. The Quality-Built Sheave That Makes Alignment Easy—for Longer Belt Life.

$2,500,000 INVESTED IN STOCK

to deliver your sheave immediately

As long as it takes our distributor's shipment to get there is as long as it takes—in most cases—to get exactly the sheave you need into your hands. Your Worthington distributor has practically any stock size you'd ever call for—if he hasn't, one of the Worthington warehouses will get it to him in 24 hours or less.

Check your sheave requirements. With more sheaves listed as "stock sizes" and more sizes in stock than any other distributor, he may be able to save you the cost of a special sheave.

Top-ranking distributors in every industrial center handle Worthington QD Sheaves and Worthington-Goodyear V-belts. They are backed by Worthington warehouses whose stocks duplicate the factory stock at Buffalo—more sizes stocked than any other sheave on the market. With 853 sizes in "A", "B", "C" and "D" sections, ½ to 600 hp, you can fill almost any rpm requirement with a *stock* sheave. Also: 332 listed stock sizes of EC Cord V-belts.

So, when you need sheaves, call your local Worthington Multi-V-Drive distributor—his name is under Worthington in A-Z Section of THOMAS' REGISTER.

For Balanced Drive Performance

Specify Worthington Multi-V-Drives, with QD Sheaves and Worthington-Goodyear EC Cord V-belts. (Goodyear EC Cord or Steel Cable V-belts are used exclusively in Worthington Multi-V Drives.)

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, New York—General Offices: Harrison, New Jersey

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

MVD92

Tip-Offs that **Pay Off**

The Blade-of-Grass Test

One of the greatest outfielders in the history of baseball used to throw a blade of grass into the air every time he went to his position. Why? Easy! . . . he was smart. Winds in a ball park are tricky and to test the wind with a blade of grass meant catching balls, winning games, a pennant, the series, and *more dough* . . . a subject dear to a ballplayer's heart.

The Who's-Listening-To-What Test

"How's your Hooper" is the popular greeting with radio entertainers. That is, it's popular if the Hooper is good . . . for the Hooper is a test of a program's popularity determined by thousands of phone calls throughout the day asking people in homes "What program are you listening to?" Naturally, a good Hooper pays off.

The Down-To-Earth Test

Warning! Before you buy that little farm . . . that place to get away from it all . . . be sure to have the soil thoroughly tested. It will save you plenty of headaches.

The How-Many-Feet-in-a-Gallon Test

Here's the tip-off that pays off on paints. When considering paints for the interior of your plant, *forget about the cost per gallon.* It doesn't mean a thing. The real factors to consider are the number of square feet of proper coverage you get per gallon and . . . because labor represents 80% of your total cost . . . *the time involved for painting.*

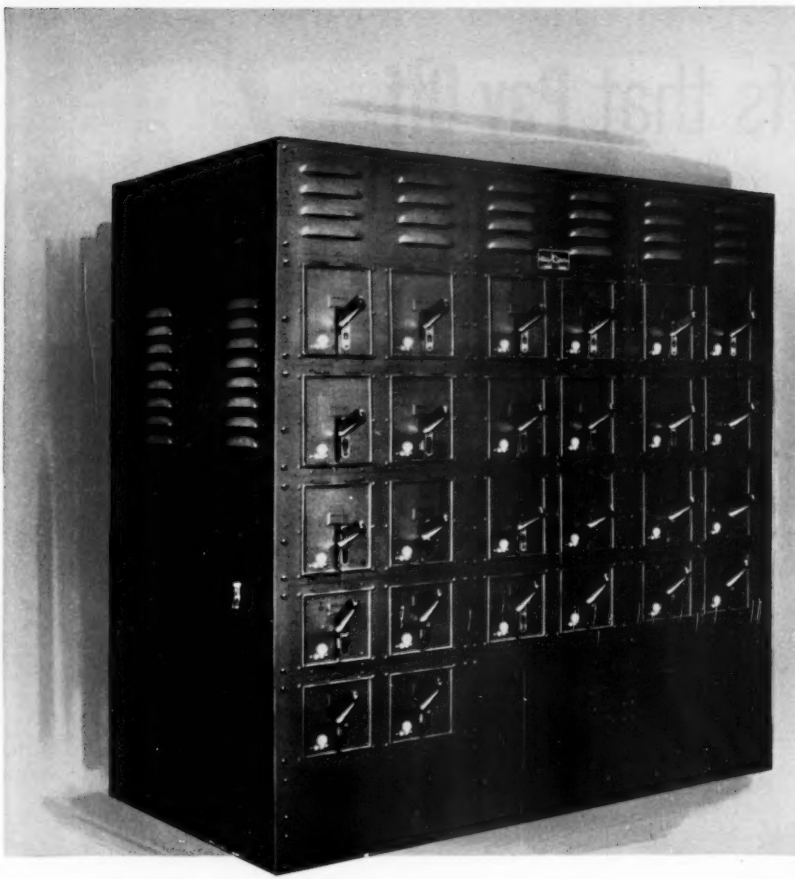
See for yourself. Compare a gallon of any paint you want with a gallon of Barreled Sunlight. Thin them both according to directions. Put them on a wall. Check the number of square feet each covers. Check the length of painting time for each. Note the difference in appearance after drying. You'll be thoroughly convinced that Barreled Sunlight . . . even though it costs more per gallon . . . will give you a better-looking, long-lasting paint job *for less money* than any other paint.

It will pay you to talk with your nearest Barreled Sunlight representative. Write, and he'll call.

U.S. GUTTA PERCHA PAINT COMPANY
2-F Dudley St., Providence, R. I.

Barreled Sunlight *Paints*

In whitest white or clean, clear, pleasing colors, there's a Barreled Sunlight Paint for every job



A typical BullDog DF-30 Switchboard. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Master-control engineered

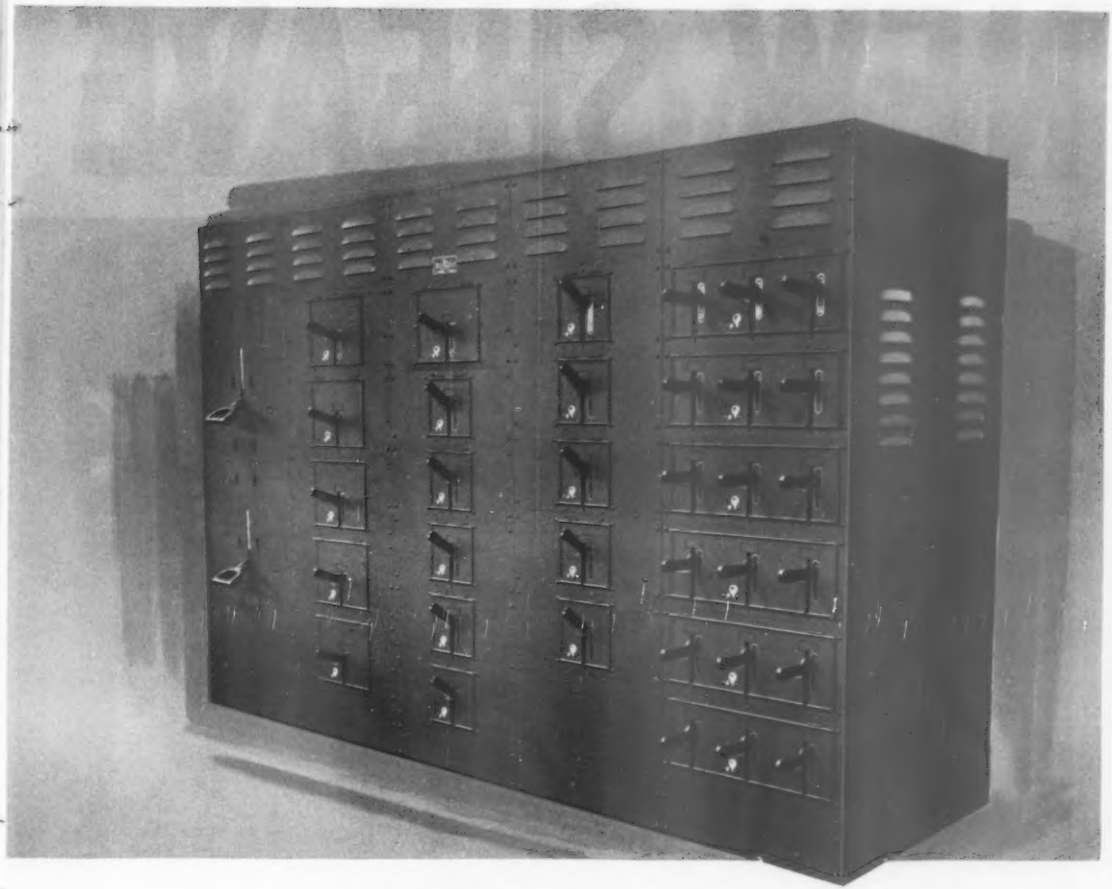
MEET the switchboard that considers both today and tomorrow in bringing you power control . . . the BullDog DF-30 type. Engineered to your present needs, it is still flexible enough to take future changes in stride.

BullDog DF-30 Engineered Switchboards are constructed compactly, but provide spare space for possible extra requirements later on. In addition, individual switch units are interchangeable, making possible quick replacements when circuit loads change.

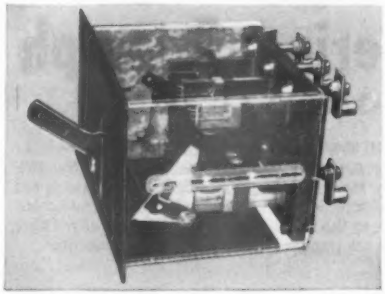
Switch units in DF-30 Switchboards are the famous BullDog SAFtoSWITCH units, approved by Underwriters for all sizes from 30 to 1200 amperes inclusive, 600 volts and less.

SAFtoSWITCH units in BullDog DF-30 Switchboards have ball-bearing action, greatly reducing friction. Quick, simultaneous double-break switch action cuts dangerous arcing. In "OFF" position, both "line" and "load" are disconnected, eliminating feedbacks.

Main circuit-breaker protection, transformers and metering equipment can be built into your DF-30 Switchboard. Ask your local BullDog Engineer for full information.



to your plant problems



Phantom view of a DF-30 SAFtoSWITCH unit, showing the frictionless ball-bearing guide mechanism. Separate fuse and switch compartments prevent accidental contact with live parts while replacing fuses. In OFF position, fuses are disconnected from both "line" and "load".

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

NEW SHEAVE

Another *Texrope* Engineering Triumph

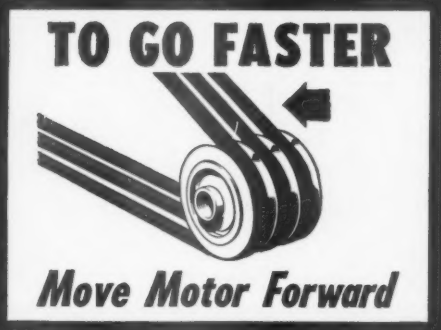
AUTOMATIC SHEAVE DOES COMPLETE JOB!

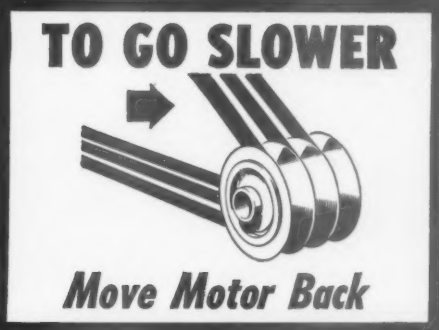
- ★ Instant speed control at lower cost than ever before
- ★ Covers most speed changing needs from 3 to 20 hp
- ★ Extremely simple — one sheave does all
- ★ No need to stop machine or take load off
- ★ Infinite variation over approximately 200% speed range
- ★ Easier starting—sheave adjusts to load.

HERE IS THE SIMPLEST, lowest cost way ever devised for changing machine speeds without stopping the machine. Simply move the motor forward to increase speed and move it back to decrease. The new *Vari-Pitch* Automatic Sheave adjusts to the new belt position *automatically*. Other parts of drive are standard *Texrope* drive components.

ALLIS-
Originators of the

Changes Speed Without Stopping





------ONE HAND DOES IT...*While Motor is Running*

This new method of speed control will lower drive costs in nearly every industry where variable speed drives are used. It will make possible savings in many industries where variable speed is not now used because of high initial cost.

Find out now how this new idea in speed control can save money for *you*.

For details see your A-C Authorized Dealer or Sales Office or write for Bulletin 20B7223. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A-2708

ALLIS-CHALMERS, 1078A SO. 70 ST.
MILWAUKEE, WIS.

CHALMERS

Multiple V-Belt Drive for Industry

A-C ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

NEW ADDITION

CROCKER-WHEELER MADE MOTOR NEWS *THEN* . . .

1894 . . . *the first electrified printing plant in the world* is installed (for the New York Life Insurance Company) by Crocker-Wheeler. Soon C-W motors were in use in the Government Printing Office in Washington, the Bureau of Printing and Engraving, the United States mint in Philadelphia. This early Crocker-Wheeler driven machinery was to be the forerunner of the modern high speed printing press.

and CROCKER-WHEELER IS MAKING MOTOR NEWS *today*—

C-W WOUND-ROTOR MOTORS

From 1 to 2000 hp.

Now Crocker-Wheeler brings you a streamlined Protected-Type WOUND-ROTOR Motor with all the up-to-the-minute advantages of the popular C-W Protected-Type Squirrel-Cage Induction Motors.

Users of C-W Protected-Type Squirrel-Cage Motors know well the advantages of Crocker-Wheeler design . . . and the many mechanical modifications which make these standard motors so versatile. Now the *same* advantages are available in wound-rotor motors.

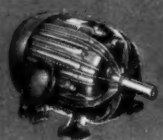
For printing, conveying, ventilation and other services that require smooth acceleration, high starting torque with low starting current, ability to start and stop or reverse frequently, or variable speed, these new C-W motors will provide unexcelled performance.

Sizes from 1 to 2000 h.p., and an exceptionally wide choice of mechanical modifications, answer practically all application problems. You may have splash-proof and totally-enclosed non-ventilated, as well as the protected-type design. Choose from vertical, NEMA D flange or C face mountings and all standard NEMA floor, or ceiling mounting assemblies. Special windings are available for crane and hoist duty.

The excellence and motor know-how built into C-W Wound-Rotor Motors is clearly explained in the new Bulletin SL-330-1. Mail coupon for your copy. *Now.*

IF CROCKER-WHEELER BUILDS IT, IT'S A BETTER BUILT MACHINE

Protected-Type Induction Motors Vertical or Horizontal



Totally-enclosed, fan-cooled Motors

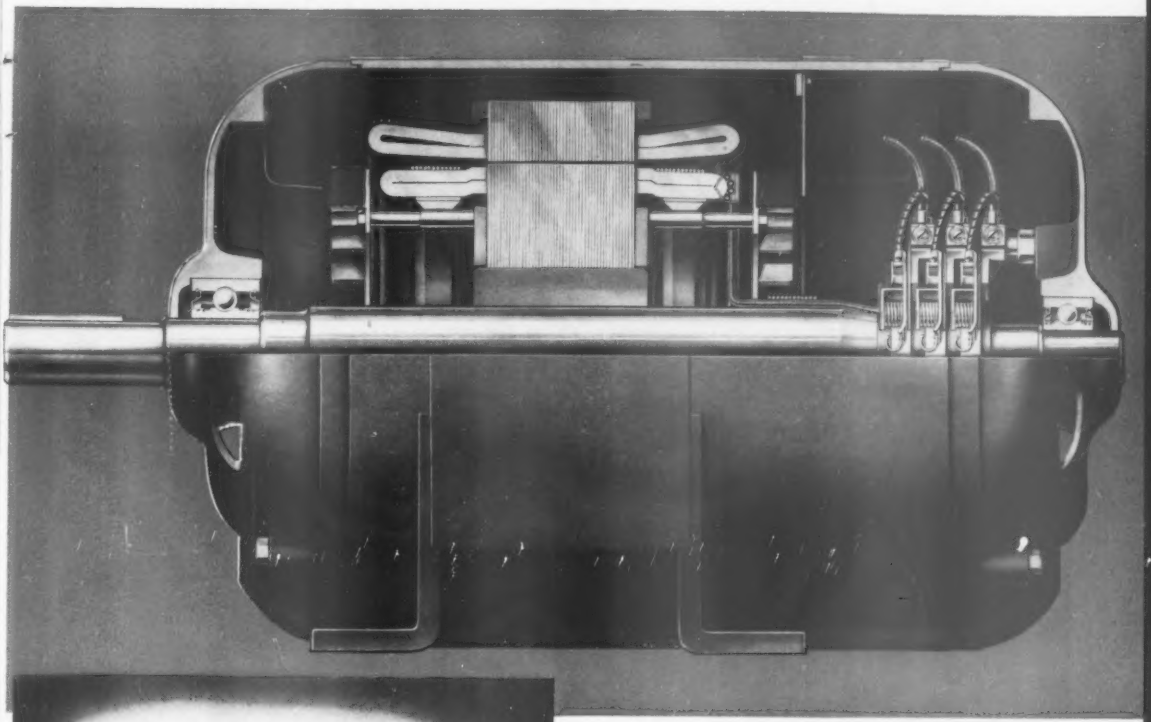
A-C Generators and High Speed Synchronous Motors

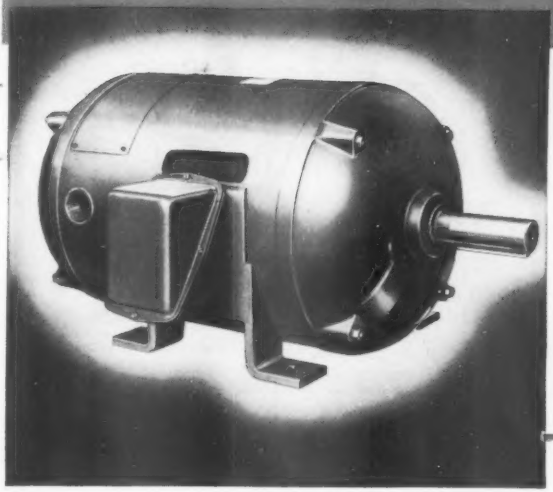
Large D-C Motors and Generators

Turbogenerators

OTHER C-W PRODUCTS TO SERVE YOUR NEEDS: A-C Induction Motors, 1 to 2000 hp; **SEALEDPOWER**, totally-enclosed, fan-cooled motors, 2 to 60 hp.; High Speed Synchronous Motors; D-C Motors, 1 to 5000 hp.; A-C Generators, high speed and low speed; Turbogenerators, 1563 to 12,500 kw; D-C Generators, 1 to 3500 kw; Motor Generator Sets, A-C and D-C, 1 to 6000 kw; Steel Mill Motors, up to 250 hp for auxiliary drives, also Heavy-duty Motors up to 5000 hp for main drives; Flexible Couplings, Pulleys, Motor bases; Motoreducers, 1 to 50 hp.

to Protected-Type line----





Better Built because---

Frames and endshields dripproof—keeps dripping liquids and falling chips out of windings.

Louvered openings on both sides of frame for maximum cooling, with effective protection.

Air guides distribute cooling air effectively.

Stator and rotor coils of vinylacetal insulated wire, protected by thoroughly-baked thermosetting varnish for maximum rigidity and long-lasting protection against electrical failure.

Slip rings cast of special composition bronze for long life, mounted on steel hub, insulated from hub by mica sleeve.

NEMA frames 364-505 have heavy rolled steel frame for strength. Sturdy welded feet.

Full details of the many other fine points of these motors are included in the new Bulletin now available. Send coupon.

CROCKER WHEELER

ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.

A Division of The Joshua Hendy Corporation

Branch Offices:

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Houston, Los Angeles, Milwaukee, New York, Philadelphia, San Francisco, Pittsburgh, Washington, D. C. Representatives in principal cities.

Crocker-Wheeler Electric Mfg. Co.
Ampere 3, N. J.

Please send new Bulletin SL-330-1, describing Crocker-Wheeler Protected-Type Wound-Rotor Motors. F—649

Name .....

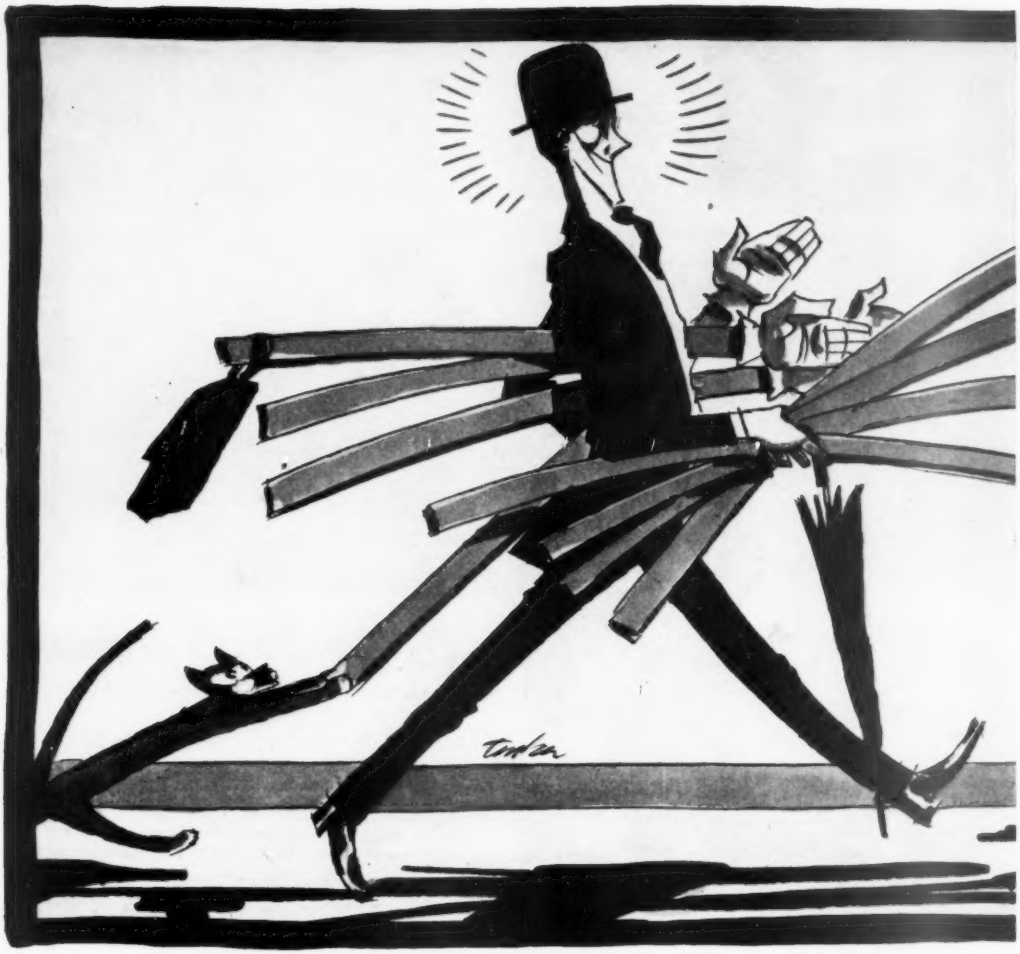
Title or Function .....

Company .....

Address .....

How many hands can an

(AN AD ABOUT EXTRAS)



WE'RE not only ambidextrous . . . we're octodextrous . . . and mister, that's dextrous!

One of the most welcome hands we offer comes at the end of the year . . . holding a nice, fat dividend check!

American Mutual has the best long-time record in the field for this kind of savings . . . 62 years of sending money your way!

We've got another hand just itching to serve you . . . a hand that's helped reduce premiums in some industries as much as 53% below the average rate.

We call this our Special I.E. Loss Control Service* . . . and we defy anyone to find a better aid in helping reduce accidents and upping production!

We've got a hand that's ready to protect your company against every possible hazard . . . including getting bitten by sharks in Iowa! (Rare)

And one of the fastest hands we offer is the one that settles claims!

"Prove it," you say . . . and we will! Just recently a policy holder had a bad accident, (a truck hit a car). Well, sir, eight minutes later an American Mutual man was on the scene . . .

AMERICAN MUTUAL . . . the first American liability insurance company

© 1946 AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

Insurance Company give you?

by Mr. Friendly

In less than 30 minutes everything was settled!

We draw the line, however, at making settlements *before* the accidents occur!

The point is...with 73 offices in major cities throughout the country we're always close at hand and always ready to serve you in the best possible way!

And, just as a clincher, may we remind you that you get this service at no extra charge with every industrial policy!

Yes, American Mutual's one *handy* company to have around!

•

Accident prevention based on principles of industrial engineering.

MAIL THIS COUPON NOW

Dept. F-24, American Mutual Liability Insurance Company
142 Berkeley Street, Boston 16, Massachusetts

Without obligation, please *rush* me my *free* copy of *The All-American Plan*, showing me how to save as much as 20% on practically every kind of insurance, except life. Also, a most helpful, free, illustrated 98-page book, *Foremanship and Accident Prevention in Industry.*

*Name*_____

*Street*_____

*City*_____ *State*_____

This Fork Truck DOES MORE WORK

FOR LESS "PAY"
because it has

DYNA-TORK *Drive*

Dynatork Drive, another in Clark's many distinguished *"firsts"* in the development of modern materials-handling methods and machines, *is in production* after proving itself under use and deliberate abuse in a cross-section of American industry. The most significant and advanced post-war improvement in fork-lift trucks, it commands attention and consideration because of the unparalleled economies and advantages it makes possible in materials-handling operations.

WHAT DYNATORK DRIVE IS:

DYNATORK DRIVE is a unique device available *only* in Clark gasoline-powered fork-lift trucks (Utilitruc model), which eliminates the clutch and the conventional transmission. By means of magnetic flux, this mechanism transmits driving force from the engine to the drive

wheels. The immediately apparent results are: flawlessly smooth flow of power, and the machine's almost instantaneous response to the directional control.

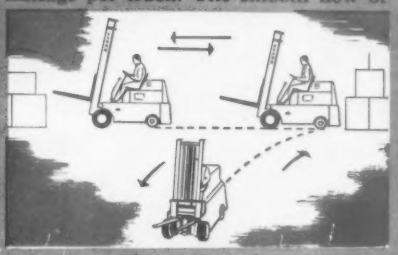
On the inside of the flywheel are two coils surrounded by magnetic fields—one for "Forward" and one for "Reverse." When one coil is energized—movement of the truck is in one direction; when energizing force is switched to the other coil, movement in the opposite direction is almost simultaneous.

Control of energizing force—and direction of travel—is achieved through flicking the finger-tip lever mounted on the steering column. Engine speed is governed by a conventional accelerator pedal.

WHAT DYNATORK DRIVE DOES:

First—*and most important*—the fork truck equipped with DYNATORK DRIVE does considerably more work at considerably less cost, than a fork truck equipped with conventional power-transmission and clutch units.

DYNATORK DRIVE provides *maximum performance*, especially for short hauls and during acceleration, and thus increases substantially the useful daily mileage per truck. The smooth flow of



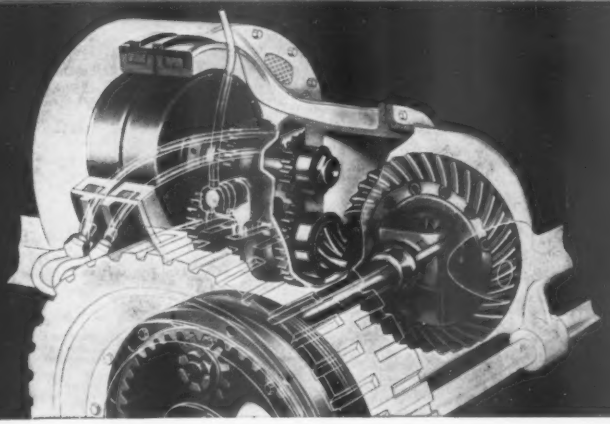
power provides unprecedented protection to materials in transit.

DYNATORK DRIVE provides unequalled simplicity of driving routine which translates into shrinkage of driver fatigue to an irreducible minimum. It prolongs tire life through virtual elimination of wheel slippage, and affords sizeable savings in maintenance and repair costs because it displaces major causes of shock and wear. But again—its undeniable and overpowering advantage is that it enables a fork truck *to do more work, day in and day out, at considerably less cost.*

INDUSTRIAL TRUCK DIVISION

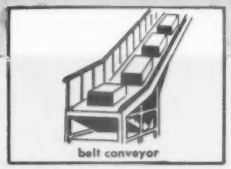
CLARK EQUIPMENT COMPANY

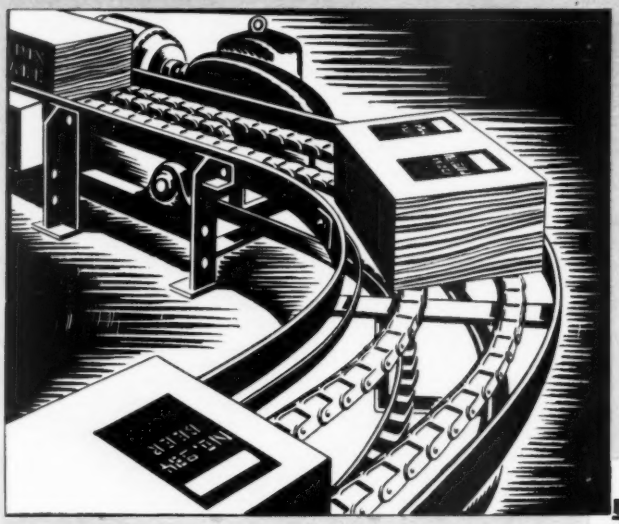
BATTLE CREEK 12, MICHIGAN

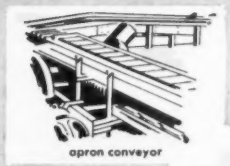


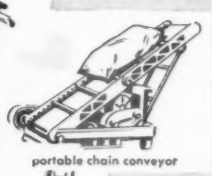
Of course, you'll want to know more about Dynatork Drive. For additional information, please direct a request on your business letterhead to address listed above. You'll find that it pays to CONSULT CLARK.

CONVEYORS for aspirin or airframes

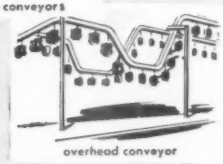

belt conveyor

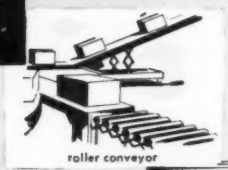

Chain conveyor with G-E electric drive

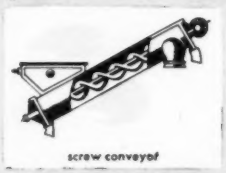

apron conveyor


portable chain conveyor

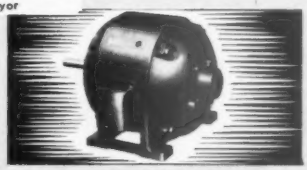
interlocking conveyors


overhead conveyor


roller conveyor


screw conveyor

bucket conveyor

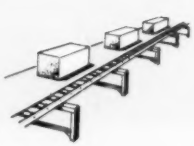

3 GOOD REASONS! Tri-Clad induction motors are protected against physical damage, electrical breakdown, operating wear and tear. Ratings from 1 to 2000 hp.

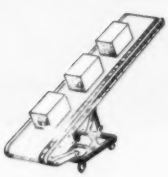
See General Electric's new MATERIALS HANDLING MOVIE

Ask your materials handling equipment supplier or G-E representative to show you "Materials Handling—In Receiving, Warehousing and Shipping"—General Electric's authoritative new movie covering in detail the latest techniques and equipment, without sales bias. When you see the movie, you will receive a copy of the 92-page technical manual which supplements the film. ASK TO SEE THIS PROGRAM NOW!

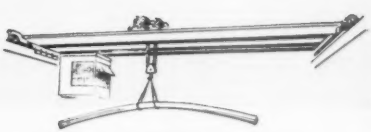
Everything electrical for MATERIALS HANDLING

CONVEYOR DRIVES





CRANE DRIVES



...POWERED by G.E.

Here's how General Electric's broad experience in engineering conveyor drives can help you cut your over-all handling costs

Among the many services we offer builders and users of materials-handling conveyor systems, two are outstanding.

The first is *sound application engineering*. Our materials-handling specialists know conveyor-drive engineering inside and out, having electrified more different types of conveyor systems than any other similar group of engineers.

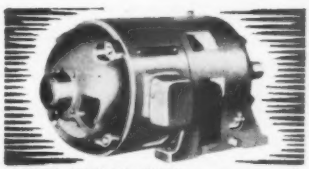
The second "plus" we offer is one of the largest and most varied arrays of electric motors, controls, and power distribution apparatus available today. Some of them are shown below. Components like these, correctly engineered into a drive will give you a system that is *right* for your needs, today and tomorrow. Consult with your local G-E office before specifying *any* conveyor drive equipment. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

QUICK, SURE STARTS! The new G-E combination starter features a tough "strong-box" magnet coil.

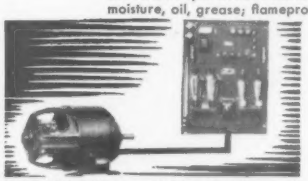
SAFE AND COMPACT! The new G-E a-c starter offers protection for men and machines in one compact unit. Easy to maintain.

ON-THE-SPOT POWER! Flamenol bus-drop cable is used for 600-volt branch circuits from bus to conveyor motors. Resists damage from moisture, oil, grease; flameproof, too.

DIAL YOUR SPEED! With a simple twist of the dial, a G-E Type ACA motor gives you stepless speed adjustment over speed ranges of 3 to 1, 6 to 1, or 20 to 1. Ratings from 3 to 75 hp.



GEARED 'WAY DOWN! You can get a wide choice of speed reduction in a G-E gear motor . . . down to a few rpm. Ratings from fractional horsepower to 50 hp.

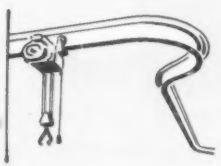


20 TO 1! G-E Thy-mo-trol drive provides speed ranges as high as 20 to 1 *from a-c power*. Speed adjustment is smooth and stepless. Ratings available from ⅛ to 25 hp.

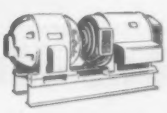
GENERAL ELECTRIC

466-70

HOIST DRIVES

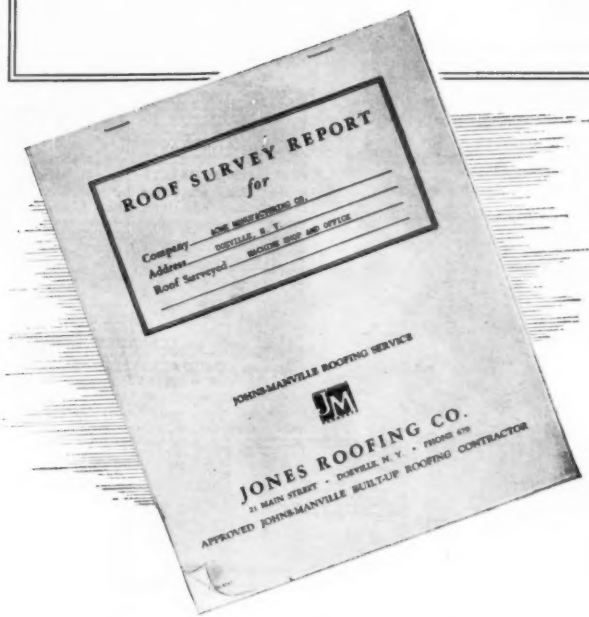


INDUSTRIAL TRUCK DRIVES & BATTERY CHARGERS



Now You can get an Exact Report on the condition of your Roof!

This free Johns-Manville service helps you plan your maintenance budget, avoid unforeseen roofing expense



Plant engineers and maintenance men say:

"It provides an accurate record of our roofs"

"It helps us plan our maintenance budget"

"Forestalls unforeseen expenses"

Take advantage of this *free* Johns-Manville service to find out the exact condition of your roof. It will enable you to make plans *now* for repairs and maintenance in the future.

That's what plant engineers and maintenance executives *like* about the J-M Roof Survey Plan.

Don't take *your* roof for granted, even though it doesn't *seem* to be leaking. Many a roof with torn flashings, dried-out felts, even rotted decks has been *assumed* to be in "good condition."

The Roof Survey Report will cover all the critical areas of your roof . . . flashings, deck, roofing felts, parapet walls, skylights, etc. It will be an accurate picture by a roofing *expert*—the J-M Approved Built-Up Roofing Contractor. And it will cost you only the trouble of *asking* for it.

Let us send you the interesting booklet, "Things You Should Know About Your Roof." It gives complete information about the *free* J-M Roof Survey Plan, together with the full story of the Johns-Manville Flexstone* Asbestos Roof. Write Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

Johns-Manville *FLEXSTONE** Built-Up Roofs

CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS DECORATIVE FLOORS • *TRANSITE WALLS • ETC.

1 Full-power Van Dorn universal motor.

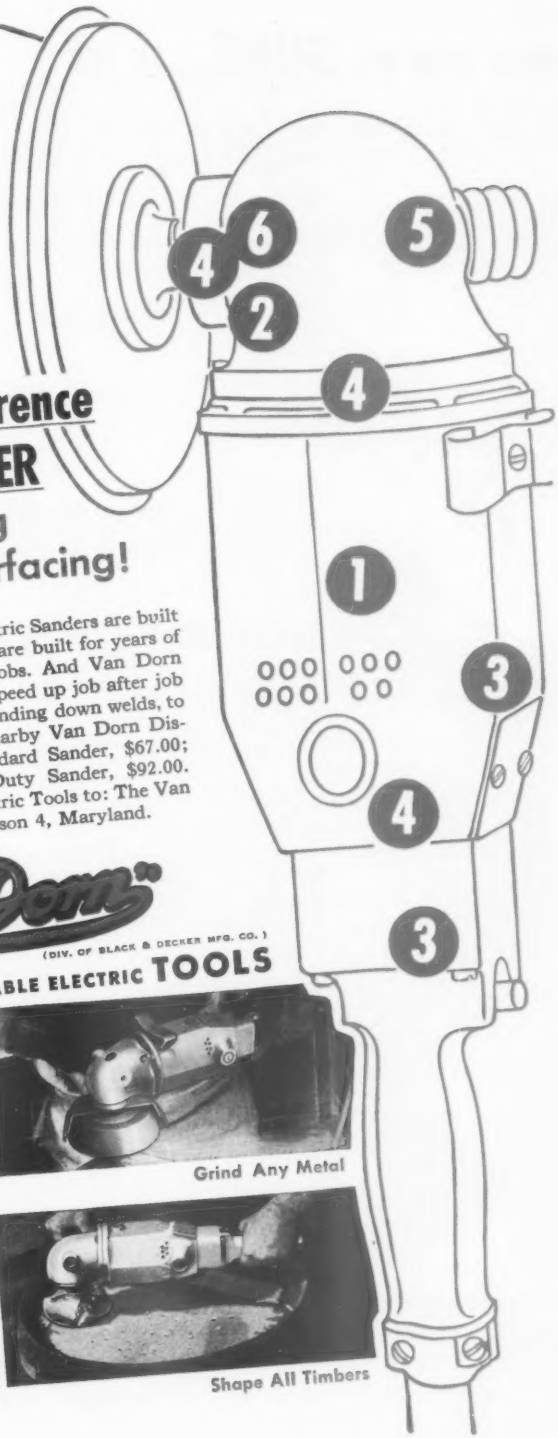
2 Spiral beveled gears of heat-treated alloy, match-lapped for smooth performance, spline-mounted for greater strength.

3 Commutator, bearings and switch sealed against abrasive dust or dirt.

4 All ball bearings on steel inserts and grease-sealed.

5 Needle roller bearing maintains spindle alignment.

6 Patented spindle lock for speed and ease in changing a variety of accessories.

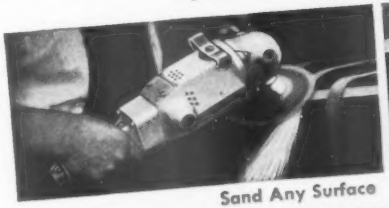


You can *SPOT* the Difference in a VAN DORN SANDER

. . . in Finer Engineering . . . in Faster Surfacing!

From switch to spindle, powerful Van Dorn Electric Sanders are built to take it! Motor, gears, bearings, spindle—all are built for years of productive service on the toughest surfacing jobs. And Van Dorn Sanders are so amazingly versatile that they'll speed up job after job in your plant—from sanding any surface or grinding down welds, to removing rust or shaping lumber. Ask your nearby Van Dorn Distributor for details on these models: 7" Standard Sander, $67.00; 7" Heavy-Duty Sander, $76.00; 9" Heavy-Duty Sander, $92.00. Write for free catalog of over 100 Portable Electric Tools to: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson 4, Maryland.

FOR POWER SPECIFY "Van Dorn" (DIV. OF BLACK & DECKER MFG. CO.) PORTABLE ELECTRIC TOOLS


Sand Any Surface

Grind Any Metal

Speed Wire Brushing

Shape All Timbers

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

NOW...

LIFE-LINE

slashes a-c motor upkeep costs

Here's how Life-Line motors can save you half the upkeep cost, and more.

A recent survey of 114 large motor users—operating 131,626 a-c motors of 1 to 50 hp—shows how much motors *really* cost when you figure actual "Life Cost".

The survey shows that the yearly average cost of periodically lubricated motors was $270 for every hundred motors installed.

On lubrication cost alone, Life-Line motors saved this $270. That's because Life-Line requires no periodic lubrication—no added lubrication of any kind.

The survey also indicates that the yearly outage cost per hundred motors, for repairs and lost machine and man-hours, was $960.

The record of 500,000 Life-Line motors in service, to date, indicates a failure rate averaging less than half that of conventional motors covered by this survey. This means over 50% indicated reduction in motor outage costs—in short, a possible saving of $480 per year with Life-Line.

Add these savings—$270 for lubrication plus $480 for outages—and the result is $750 per hundred motors per year.

Can you afford to pass up savings like these? Get the facts on the savings possible in your plant. Ask your nearby Westinghouse representative for a copy of B-4321 "How to Cut Motor Costs $750". Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21508-D

Westinghouse

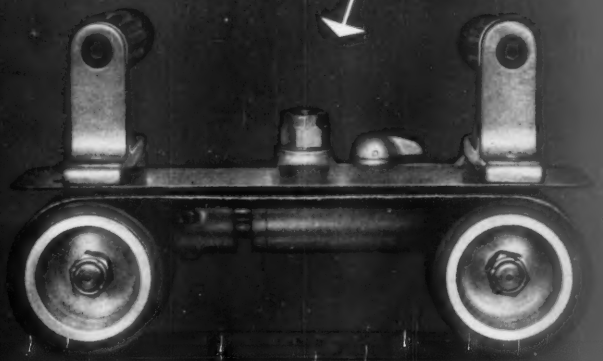
Life-Line

Motors

SAVING
BY ELIMINATING LUBRICATION
$270
SAVING INDICATED
BY REDUCTION OF MOTOR OUTAGES
$480
TOTAL SAVING
PER YEAR PER 100 MOTORS
$750
DO NOT
LUBRICATE

IN 1963– all belt sanders will look like this

"The most revolutionary new tool to be developed for abrasive use since the advent of disc sanding twenty years ago"



The BELT SANDER by Buckeye

for all types of surfaces, finishes and materials

"An entirely new concept of abrasive tool design and operation"

Be prepared to revise your conception of sanding and finishing operations when you see the Buckeye Belt Sander in action! Adaptable to any finish or material, it is the first tool of its kind that will follow any surface contour, concave or convex.

Here is a completely new tool, with ample power for fast removal of metal, a compact lightweight tool, easy to handle and a glutton for punishment. Tested, proved and accepted, the Buckeye Belt Sander leads the way into a new era of abrasive tool design and operation.

See your Buckeye representative or write for complete information

Buckeye Tools CORPORATION Division 13 Dayton 1, Ohio

1 First step in this installation of Kaylo Heat Insulating Block is the welding of long Nelson Insulation Pins to the surface. Section of a large dryer is shown here.

2 Block is then impaled on the pins and pushed against the metal surface. Two layers are being applied. Workman here applies first layer; "Speed Clips" over second layer anchor both layers in place.

3 Kaylo Heat Insulating Block is available in standard block sizes. Where special shapes are needed, the block can be easily cut to fit with ordinary hand or power tools.

KAYLO HEAT INSULATING BLOCK

Remarkable advantages combined in one material

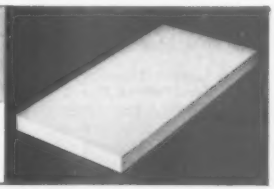
4 Final step is cutting off projecting ends of insulation pins as shown. (A cement finish may be applied over the block and troweled smooth.)

5 When completed, this dryer will have the best in heat insulation—Kaylo Heat Insulating Block . . . lightweight, strong, highly efficient and easy to install.

KAYLO Heat Insulating Block combines those outstanding advantages that almost every user of heat insulating block is seeking—light weight, strength, high efficiency and a wide temperature range—from ambient temperatures up to 1200° F.

This new insulation is a lightweight mineral product, efficient through the whole temperature range for which it is recommended. It is strong enough to bear the weight of workmen walking on it or ladders leaned against it. It is less fragile and less subject to abrasion than most insulating blocks—less affected by moisture or occasional wetting.

KAYLO®
Heat Insulating Block



AMERICAN STRUCTURAL PRODUCTS COMPANY
Subsidiary of
OWENS-ILLINOIS GLASS COMPANY

SEND COUPON TODAY

AMERICAN STRUCTURAL PRODUCTS COMPANY
Dept. F-415, P. O. Box 1035
Toledo 1, Ohio

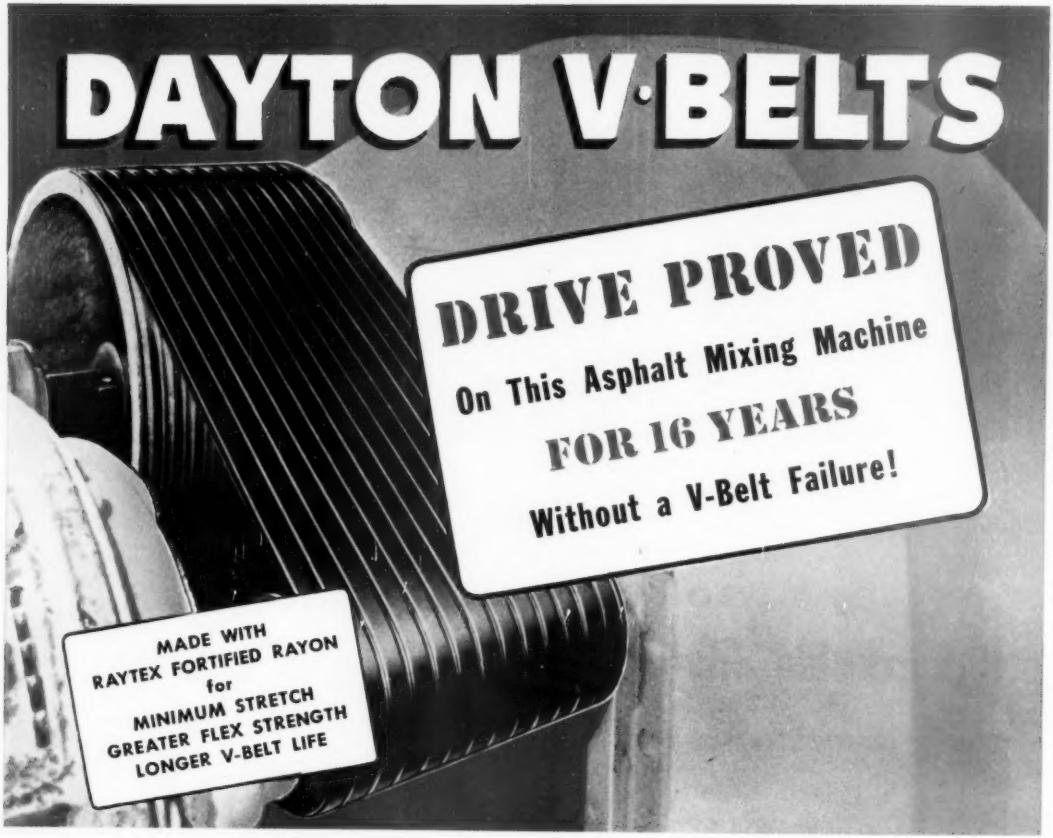
Gentlemen:

Please send: ☐ Free illustrated booklet, "Kaylo Heat Insulating Block."
☐ Free sample of Kaylo Heat Insulating Block.
☐ Your representative, with full information.

Name_____

Address_____

City_____ County_____ State_____



Only Dayton V-Belts are DRIVE PROVED for the Job

HEAVY-DUTY DRIVES

The Dayton Thorobred, standard of industry. Bends without straining or heating. Always runs true, flexes freely around the pulley without squashing. Equally efficient on V-Flat drives. Matched in sets for multiple drives.

LIGHT-DUTY DRIVES

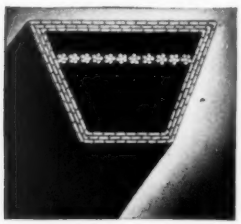
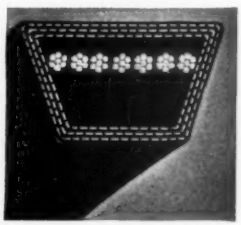
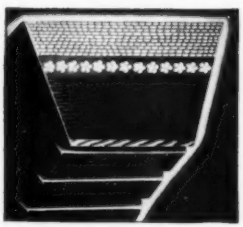
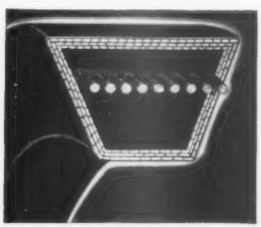
The Dayton FHP V-Belt, for fractional horsepower motors on small machines and appliances. Especially designed for quiet, vibrationless performance. Exceptionally strong. Will not twist, squash, or stretch.

SMALLER PULLEY DIAMETERS

The Dayton Cog-Belt, the most flexible V-Belt made. Permits use of 25% smaller pulley diameters and shortest centers for greater saving of space. The built-in Cogs eliminate bumping, jarring or inching.

HIGH-SPEED DRIVES

Dayton Steel Cable V-Belts for extreme load conditions. Fine gauge, heat-treated steel strands, cabled for extra strength. Evenly spaced and absolutely parallel. Available in patented Cog, or standard V design.

Cut Maintenance Costs

. . . and they are as near as your phone!

A ruined bearing, a burned-out motor, or a drive failure are tragedies that are recorded in red ink. Eliminate these drive breakdowns —add years to the life of your equipment— reduce maintenance with Dayton V-Belt Drives. For Dayton V-Belt Drives are *Drive-Proved* to cut maintenance costs to a minimum.

In thousands of plants . . . under every conceivable operating condition, they have proved their ability to transmit full power, with little or no transmission loss. They won't slip or stall and overload motors. They cushion bearings by absorbing shock loads and suddenly applied power. And they wear and wear and wear, despite abrasive conditions, heat, cold or moisture.

Drive Proved Dayton V-Belts are available for your plant, and they are right at your elbow.

As Near as Your Telephone

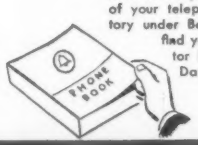
There is a Dayton V-Belt Distributor near you. He is equipped with the specialized knowledge to recommend the right drive to serve you most efficiently. If it's an unusual application, he has the resources of the entire Dayton organization to call on. You'll find him listed in the classified section of your telephone directory or his representative is now calling at your plant.

Instant Maintenance Service

Your Dayton Distributor maintains complete stocks of Dayton Drive Proved V-Belts and Pulleys. He is prepared to give you instant service for existing or future drives, and to provide you with an immediate source of mill supplies.

Equip your drives with Dayton Drive Proved V-Belts and be sure you are getting the maximum in drive performance at a minimum maintenance cost. Call your Dayton V-Belt Distributor today. *The Dayton Rubber Company, Dayton 1, Ohio.*

IT'S EASY TO BUY DRIVE PROVED **DAYTON V-BELTS**



Look in the yellow pages of your telephone directory under Belting. You'll find your distributor listed under Dayton V-Belts.

Phone him. He has the specialized knowledge to recommend the right "*Drive Proved*" Dayton V-Belt for your particular drive.

He maintains complete stocks of Dayton V-Belts and Pulleys for your needs. Assures you that your drives will always perform with top efficiency.

Dayton Rubber

THE MARK OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER

FOR BETTER INDUSTRIAL LIGHTING LOOK FOR THE "HIDDEN PLUS"

You can't see the ballast in an assembled fluorescent lighting fixture—yet the quality of the ballast largely determines the quality of the fixture.

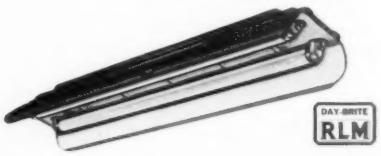
A Certified ballast is the "hidden plus" which assures full lamp life, quiet operation, rated light output and dependable performance for the life of the fixture. In short, a fixture with a Certified ballast will do its job *well* over a *long period* of time.

But how can you identify a top quality ballast? Easy! Just look for the Certified E. T. L. shield right on the ballast.

CERTIFIED E.T.L. SPEC NO. 6 HIGH PF

This shield can be placed *only* on those ballasts which have met strict specifications and have been checked and tested by Electrical Testing Laboratories, Inc., an *impartial* judge.

The easiest way to turn out an "economy" fixture is to install a cheaper ballast—a part you don't normally see. But "cheap" fixtures *can't* deliver dependable, efficient lighting. Demand the "hidden plus"—the Certified E.T.L. shield on the ballast—and get *better* lighting.



DAY-BRITE'S NEW "TUR-A-TOP" FIXTURES HAVE THE "HIDDEN PLUS"... AND MORE!

You'll find the ballasts in "Tur-A-Top" fixtures are Certified E.T.L. ballasts. And you'll find many other points of superiority, such as:

- ✔ **ONE-PIECE TOP**, stamped out of deep drawing steel—strong and attractive in appearance.
- ✔ **TWO COATS OF PORCELAIN** for extra resistance to chipping, acid and alkali.
- ✔ **RIGID LAMP HOLDERS** fastened to the stamped top for *extra* strength.
- ✔ **NO-BLINK LAMP STARTERS** are easily accessible without disturbing the lamps.
- ✔ **BEADED REFLECTORS** to assure that "Tur-A-Top" reflectors can never become bowed or wavy.
- ✔ **WING NUTS** have extra large 2-inch diameter to prevent chipping, assure positive mounting of reflector to channel. Off and on in one minute—no tools required.

Like all machinery, an industrial lighting fixture is best judged on the basis of *high quality* . . . to assure low maintenance and replacement cost. Start *right* . . . with Day-Brite. Specify Day-Brite "Tur-A-Top" fixtures . . . and save money in the long run. Write today for Bulletin 30-B.

IT'S EASY TO SEE WHEN IT'S

DAY-BRITE *Lighting*

Day-Brite Lighting, Inc., 5441 Bulwer Avenue, St. Louis 7, Mo.
In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario

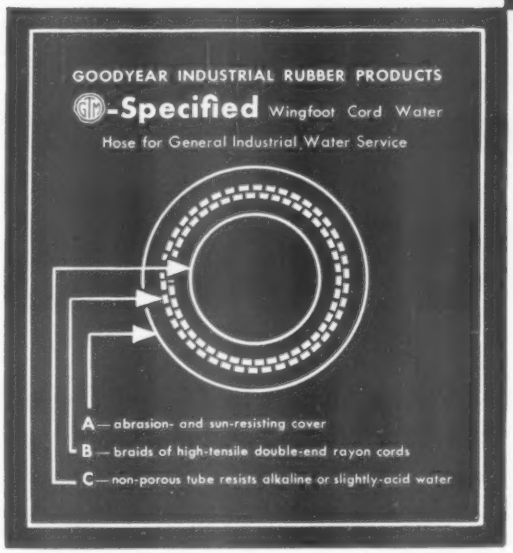
219

DISTRIBUTED NATIONALLY BY LEADING ELECTRICAL WHOLESALERS

WINGFOOT CORD AIR HOSE *is ideal for general-purpose industrial use, such as light and medium pneumatic-tool duty. Red cover, lightweight, available in long lengths.*

Specify Wingfoot Cord Hose for longer on-the-job life

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified Wingfoot Cord Air Hose
for General Industrial Service.
A — cover of smooth, soft, abrasion-resisting rubber
B — braids of strong, double-end rayon cord
C — tube of non-porous, non-clogging, oil-resisting rubber


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified Wingfoot Cord Water
Hose for General Industrial Water Service
A — abrasion- and sun-resisting cover
B — braids of high-tensile double-end rayon cords
C — non-porous tube resists alkaline or slightly-acid water

WINGFOOT CORD WATER HOSE *is outstanding for use in general applications, including general contracting, construction, etc. Flexible, smooth black cover, made in long lengths.*

IF you handle air or water in your plant, it will pay you to investigate WINGFOOT CORD AIR HOSE and its twin, WINGFOOT CORD WATER HOSE. They're both extremely flexible, non-kinking and long-lived hose at an economical price.

Reason is — they're built with RAYON high-strength, double-end cords that mean added strength, longer life and lowest cost in the long run.

Ask the G.T.M.—Goodyear Technical Man — or your nearest Goodyear Industrial Rubber Products Distributor about these two WINGFOOT hoses, as well as other types of hose in the family of Goodyear quality products. Consult them about Flat Belts, V-Belts, Molded Goods, Packing and Tank Lining, too—or write Goodyear, Akron 16, Ohio.

Wingfoot - T.M. The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

TO CONTROL *ANY* MOTOR...

A GENERAL PURPOSE ACROSS-THE-LINE-STARTERS for *squirrel-cage motors*, or for use as primary switches on *wound rotor motors* are offered in Manual, Magnetic, Combination, Reversing, and Multi-speed types.

MANUAL STARTERS IN NEMA sizes 0 and 1 are offered in a variety of enclosures.

MAGNETIC STARTERS provide remote control, available in NEMA sizes 0 through 7 for motors to 600 hp.

COMBINATION STARTERS combine a full voltage magnetic starter and a disconnecting switch (either fusible or non-fusible) or an air circuit breaker, in a single enclosure.

REVERSING STARTERS for starting, stopping and reversing *squirrel-cage* motors to 200 hp. Also MULTI-SPEED STARTERS for two, three and four speed motors in Manual and Magnetic types.

B WHEN REDUCED VOLTAGE STARTING is a requirement, Allis-Chalmers offers a line of Manual and Magnetic Auto-Transformer Reduced Voltage Starters as well as Magnetic Primary Resistor Starters.

Specify an Allis-

Allis-Chalmers Offers Both Full and Reduced Voltage Starters for Squirrel-Cage and Synchronous Motors as well as Control for Wound Rotor Motors.

☛ **YOU GET WIDE SELECTION** of starter type, size and enclosure for each type motor.

☛ **YOU GET DEPENDABLE OPERATION!** Allis-Chalmers starters are generously designed, durably built.

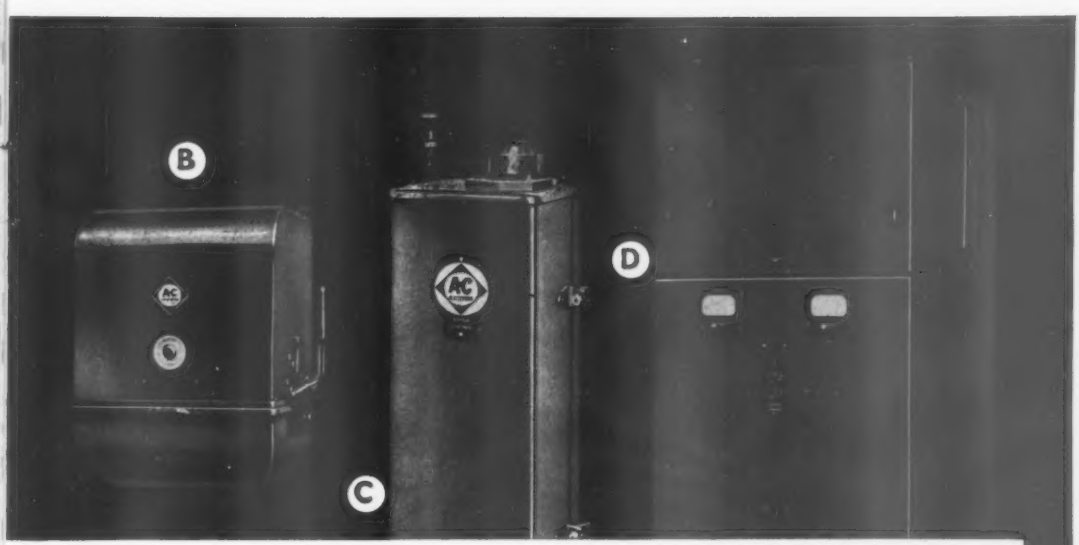
☛ **EASE OF MAINTENANCE** results from *built-in* accessibility of renewable parts.

☛ **MANY PROTECTIVE FEATURES!** Overload, undervoltage, interlocking and other devices mean greater safety for equipment and personnel.

☛ **PLUS BROAD APPLICATION EXPERIENCE!** And that means the *right* starter for *your* job! Allis-Chalmers engineering experience on over 1600 products covers every major industry.

Pioneers in Power and Electrical Equipment From Generation Through Utilization

ALLIS-



C FOR WOUND ROTOR MOTORS a wide variety of starters are offered. Typical are: Manual Primary and Secondary, Magnetic Primary and Secondary, Magnetic Primary with Manual Secondary, and Drum Type Reversing Primary and Secondary.

FOR SYNCHRONOUS MOTORS, three types of Starters are built by Allis-Chalmers: Full Voltage Magnetic, Reduced Voltage Semi-Magnetic, and Reduced Voltage Magnetic. All types are built in sizes to control motors from 20 to 3000 hp and feature positive synchronizing, maximum accessibility, easy adjustment, durable construction, automatic shut-down if starting sequence is incomplete, and other protective measures.

D HIGH INTERRUPTING CAPACITY STARTERS are built for High Voltage *squirrel cage*, *wound rotor* and *synchronous* motors. These starters have current limiting features and can be connected directly to circuits requiring up to 150,000 kva interrupting capacity at 2300 volts and 250,000 kva at 4160 to 4600 volts without a back-up circuit breaker.

Chalmers MOTOR STARTER!

THE NAME ALLIS-CHALMERS, throughout industry, stands for quality-built, lasting electrical equipment. You can depend on Allis-Chalmers Motor Starters to give you the same kind of performance. Here is exactly what we offer you:

Both Manual and Magnetic, Full and Reduced Voltage Starters for Squirrel-Cage and Synchronous Motors . . . Manual and Magnetic Starters for Wound Rotor Motors — all for widest possible range of horsepower and voltages.

Depend on this wide range of starters, backed by industry-wide application engineering experience, for the answer to *your* control needs. You can specify an Allis-Chalmers starter to control *any* motor, regardless of size! See your nearest A-C Authorized Dealer or Sales Office, or write direct for bulletin 14B7132. A-2677

ALLIS-CHALMERS, 1078A SO. 70 ST.
MILWAUKEE, WIS.

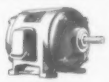
Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

A-C ALLIS CHALMERS

CHALMERS

Sold . . .
Applied . . .
Serviced . . .

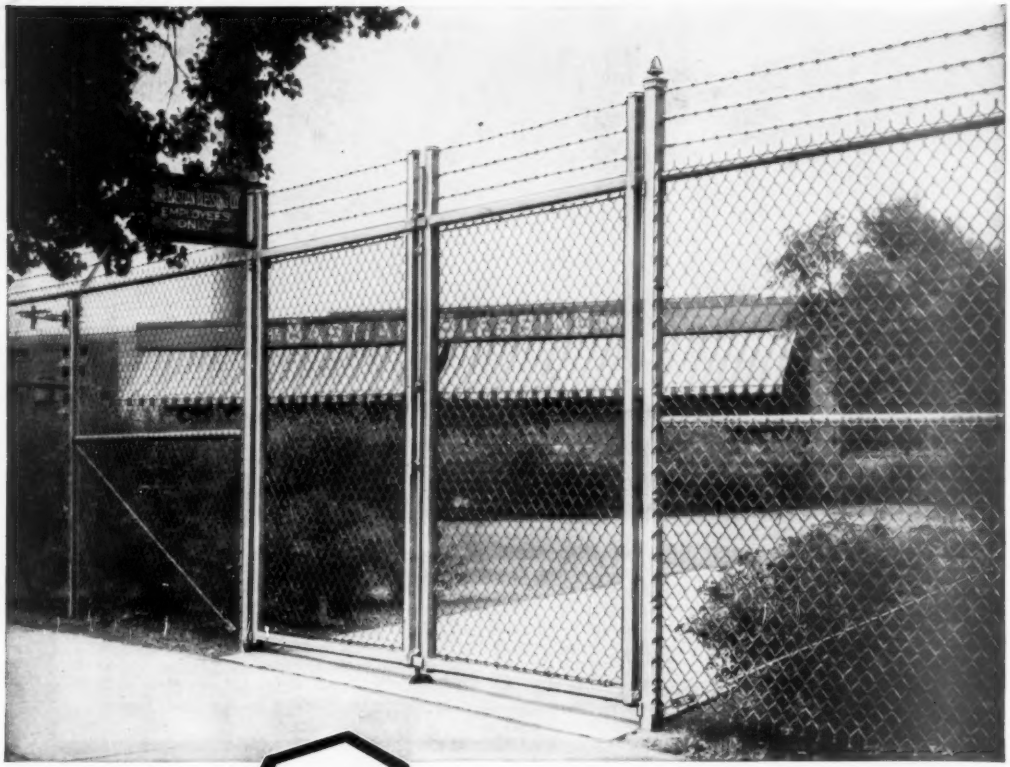
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.



Puts a STOP to Trespassing!

Like a tough, durable sentinel, an Anchor Chain Link Fence will keep your plant grounds and buildings free of trespassers, snoopers, agitators, all kinds of trouble-makers. It is made in a wide variety of heights and styles. One of our trained Anchor Fence Engineers can recommend the installation best suited to your needs.

In addition, an Anchor Chain Link Fence enables you to make full use of outdoor space with utmost safety, for storing materials and supplies . . . thus freeing factory space and making it unnecessary to build at this time. And it will help you direct a lot more systematically the flow of motor traffic and employees in and out of your plant.

Extra life and greater protection are built into every Anchor Fence through several time-tested, *exclusive* features. *Deep-Driven Anchors* are an example. They are clamped to the posts at right angles to the fence line, driven deep in the subsoil to hold the fence erect and in line at all times. Ask your local Anchor branch for more details, or write for the informative booklet shown below, to: ANCHOR POST FENCE DIVISION, Anchor Post Products, Inc., 6620 Eastern Ave., Baltimore 24, Maryland.

Write today for your copy of
FREE ILLUSTRATED CATALOG

Contains structural diagrams, specification tables, installation photos of many types and uses of Anchor Chain Link Fence in leading plants all over the country.

Anchor Fence

Nation-wide Sales and Erecting Service

8 outstanding N.B.M. BABBITTS

Help Give You Better Bearing Performance . . . Longer Bearing Life

Good babbitt is the result of using Virgin Metals, correctly proportioned and blended under close laboratory control. You find *all* these qualities in N-B-M Babbitts.

The 8 N-B-M Babbitt Metals shown are the result of years of research combined with actual engineering analysis of all types of bearing lining problems. Each of these N-B-M Babbitt Metals is "custom-alloyed" for specific types of service conditions. Thus, each has definite advantages over so-called "all-purpose" babbitts—advantages that result in longer, more economical bearing service.

These "Custom-Alloyed" bearing lining metals have effected important savings in plant maintenance—and big improvements in product performance. Every Product Designer or Plant Engineer should have engineering data on the complete line of these better N-B-M Babbitt Metals.

Here is Complete Data on N-B-M Babbitt Metals . . . This folder describes all 8 N-B-M Babbitt Metals, giving data on application, physical properties, preparation of bearing shells and pouring. Write for your free copy!

NBM

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

4930 Manchester Avenue • St. Louis 10, Mo.

PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

THESE BLACKHAWK PRODUCTS CUT YOUR MAINTENANCE AND PRODUCTION COSTS

BLACKHAWK SOCKET WRENCHES CUT YOUR COSTS 4 WAYS

LOCK-ON

This exclusive patented Blackhawk feature locks combinations together rigidly. Sockets can't come off except by thumb release button. Eliminates lost time, damage and injury from sockets falling in machinery, gear boxes, etc.

HOT BROACHING

This *original* Blackhawk feature insures smooth socket walls — eliminates ripped socket walls and consequent cracking, rust and nut wear.

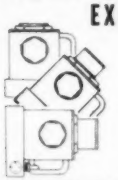
COMPLETE RANGE

Whether it's midgets or big brutes, you'll find a Blackhawk socket for the job. And the assortment of handles and attachments permit hundreds of combinations — eliminate wrench "specials".

TORQUE INDICATORS

Blackhawk tension wrenches range in capacity from 33 to1000 ft. lbs. They assure you of correct tensions—eliminate bolt breakage, gasket blow-bys, assembly breakdowns, etc.

ONLY BLACKHAWK HYDRAULIC JACKS GIVE YOU THESE EXCLUSIVE ADVANTAGES



94% EFFICIENCY
Eliminates "man-killing" friction loss that cuts screw-type jacks to 12 to 30% efficiency.

MULTI-DIRECTIONAL OPERATION Pump-on-side feature permits full power in any position vertical to horizontal.

LONGER LIFE
Exclusive Blackhawk process produces mirror smooth cylinders, reduces cup wear.

Porto-Power MAKES "SAMSONS" OUT OF MAINTENANCE MEN

***ONE* Man With a Porto-Power Can Do These Jobs**

Pull Gears, Wheels and Pulleys
Porto-Power combination pulls quickly, smoothly, safely, without damage.

Raise Sagging Beams—
Porto-Power with attachments builds up to any length — works with full power at any angle.

Lift Machinery
Toe-lift Porto-Power attachments get under low machinery — remote control lets operator work at distance.

Pressing and Testing
Porto-Power can be used in press built from *free* Blackhawk plans. Can be gauge-equipped

Equipment Maintenance
Attachments adapt Porto-Power to dozens of jobs such as straightening frames, axles, etc.

A Product of BLACKHAWK MFG. CO., Dept. F-2709, Milwaukee 1, Wisconsin

BLACKHAWK

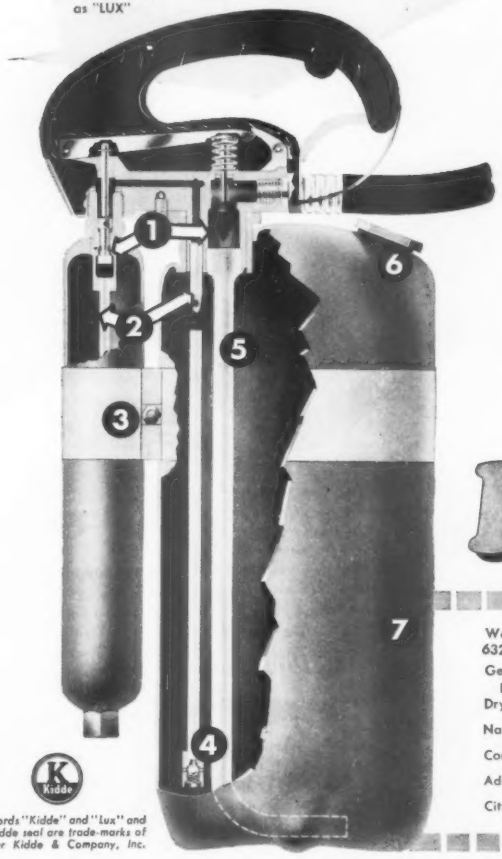
HAND JACKS • WHEELED JACKS • SOCKET WRENCHES • PORTO-POWER

A New DRY CHEMICAL EXTINGUISHER WITH Trigger-Finger Control

(nothing new to learn)

Here, at last, is an extinguisher that's designed *right* to make the most effective use of an effective fire-extinguishing agent. *Kidde* Dry Chemical Extinguishers—made in 20- and 30-pound capacities—are operated simply by pulling a trigger—the same familiar, time-tested method used on all *Kidde** carbon dioxide (CO_2) extinguishers.

*Also known as "LUX"



The words "Kidde" and "Lux" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

PLUS these 10 other big features

1 *Simultaneous opening of CO_2 and powder valves.* No trapping of gas pressure in powder chamber *before* the discharge starts.

2 *Quicker transfer of pressure to powder chamber.* Siphon tube carries CO_2 to outlet in powder chamber, where it expands to a gas.

3 *CO_2 cartridge easily replaced.* Just loosen name band holding cartridge—then unscrew cartridge. Same size cartridge for both 20- and 30-pound extinguishers.

4 *CO_2 fluffs up powder—prevents packing.* Small port at bottom of CO_2 outlet tube allows gas to stir up powder.

5 *Powder discharges from top through siphon.* No danger of packing at hose connection.

6 *Powder filler cap needs no tools.* Unscrews easily for refilling of extinguishers in the field. Filler cap is safety-vented.

7 *Lightweight cylinder for ease of carrying.* Pound for pound, the *Kidde* Dry Chemical Extinguisher packs more fire-fighting punch!

8 *Better powder dispersion pattern.* Diffusion baffle in horn gives greater coverage, more effective application. No shut-off valve in horn to trap powder under pressure in hose. No rodding out of hose after use.

9 *Extinguisher tested for operation at* −40°F.

10 *Improved powder and packaging.* Powder specially processed to make it free-flowing; packed in weatherproof containers. 30-pound carton contains three 10-pound cans —for easy refilling of either 20- or 30-pound extinguishers. 50-pound containers also available.

Walter Kidde & Company, Inc.
632 Main Street, Belleville 9, N. J.

Kidde

Mail the coupon for full information.

Walter Kidde & Company, Inc.
632 Main Street, Belleville 9, N. J.

Gentlemen:

Please send me further information on the *Kidde* Dry Chemical Extinguisher.

Name.....

Company.....

Address.....

City.....State.....

This building would

examples of changes made during construction at low cost

DUST COLLECTING SYSTEM —its exact location was not determined until after the building was well along.

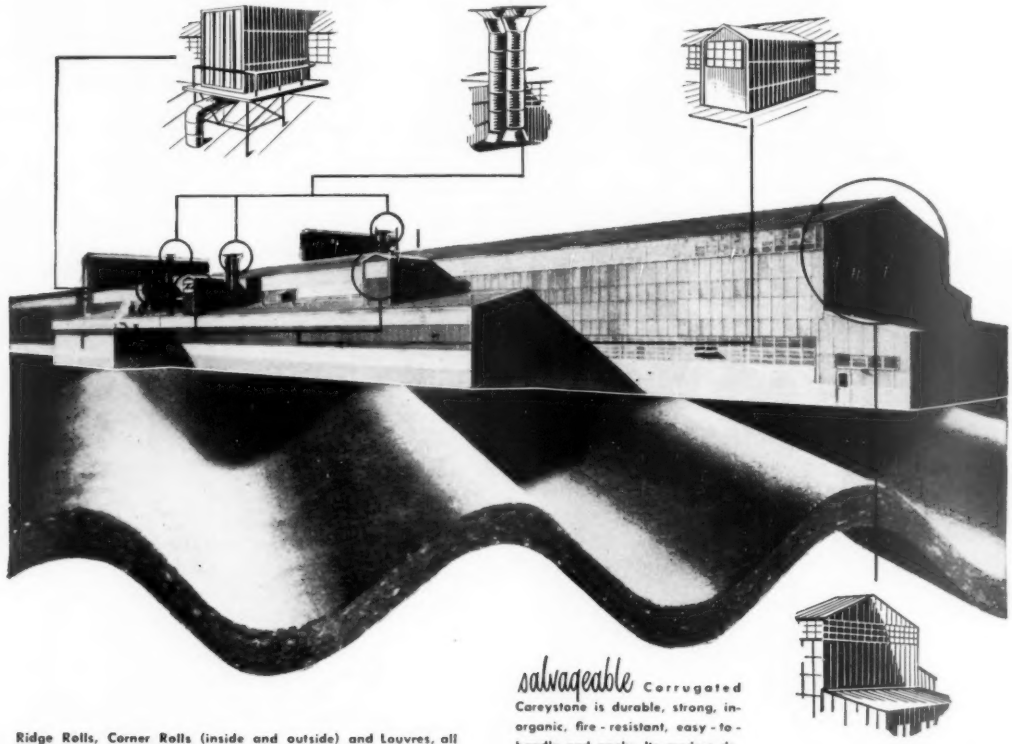
Due to the flexibility of Corrugated Careystone, even major changes and additions were made quickly and with relative ease and economy.

STACKS — to take off exhaust from paint and ceramic coating spray booths.

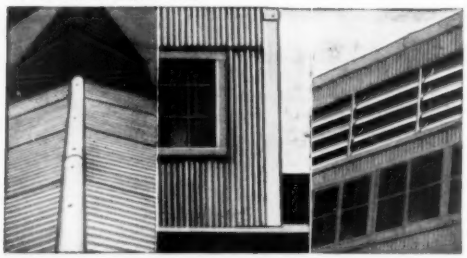
Careystone's resistance to fumes and heat made these additions practical and economical. No special protective materials were necessary.

PENTHOUSES—to house vertical conveyors at temperatures up to 150° F.

New wall openings made after walls were in place . . . with a minimum of time and expense. All Corrugated Careystone was reused in the new plan.



Ridge Rolls, Corner Rolls (inside and outside) and Louvres, all made of Asbestos-Cement, are available from Carey in sizes to fit all construction requirements



salvageable **Corrugated Careystone is durable, strong, inorganic, fire-resistant, easy-to-handle and apply. Its modern design fits it for modern interiors and modern exteriors—for a new kind of modern construction.**

END WALL—designed for future expansion. Wall can be dismantled and Corrugated Careystone reused if building is extended to gain more floor space.

easy application

SAW IT **NAIL IT** **BOLT IT**

cost you 40% less, too, with Carey stone

We built this plant with our own products . . . to make more products to build more plants! We estimate we saved as much as 40% over conventional masonry construction by using Careystone Corrugated Asbestos-Cement Sheets. This should be real news for you—especially if you are making plans for a new building or changes in present ones. We needed to get a new plant into operation quickly. We did it by building it with Corrugated Careystone.

For commercial and industrial building and for all light-weight construction, we know of no building method that takes less time in erection; that withstands weather any better; that offers more flexibility in usage or expansion; that requires less maintenance; that provides more protection from fire, weather, decay and rot; or that costs less.

Most plants undergo some changes while under construction. Buildings built with Asbestos-Cement Careystone, Corrugated or in flat sheets, cost less to change, cost less to build, cost less to maintain!

SEE FOR YOURSELF. Write Carey for "Manual 808"—address Dept. FM-6

specifications of corrugated Carey stone

FOR WALLS • ROOFS • PARTITIONS

1. 4.2" Corrugation. 2. Approximately 3/8" thick 3. Weight: 3.75 lb. per sq. ft. 4. Length: Up to and including 12'. 5. Width: 42" 10 corrugations. 6. Maximum purlin span 4'6". 7. Maximum girt span 5'6".

Enclosure strips, fasteners and accessories, made especially for use with Corrugated Careystone, can also be furnished by Carey.

Flat Asbestos-Cement Sheets
85% Magnesia • Asbestos
Industrial Rock Wool
Pipe Coverings
Blocks • Batts • Papers
Built-up Roofing
Roof Coatings
Highway Products

Carey

In Canada: The Philip Carey Co., Ltd.
1557 MacKay Street, Montreal 25, P. Q.

Offices in principal cities

THE PHILIP CAREY MANUFACTURING CO., CINCINNATI 15, OHIO

every handling job is easier with TOWMOTOR MH!

FINGER-TIP HYDRAULIC CONTROL
another Towmotor efficiency feature!

Hydraulic lifting and tilting controls, plus steering column gear shift . . . all in easy reach for precision placement of heaviest loads!

TOWMOTOR precision controls enable one man to handle and place all loads swiftly and accurately. In loading, unloading or stacking right up to the ceiling, TOWMOTOR **M**ass **H**andling simplifies difficult handling jobs, with all controls engineered for the operator's convenience. Compare the Efficiency Features of TOWMOTOR with any other lift truck. You'll see why TOWMOTOR makes every handling job easier, faster, safer. Write for current issue of Handling Materials Illustrated, TOWMOTOR CORPORATION, Division 5, 1226 East 152nd Street, Cleveland 10, Ohio. Representatives in all Principal Cities in U. S. and Canada.

TOWMOTOR
THE ONE-MAN-GANG

FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

STOP, LOOK AND READ HOW EASILY **LVD Flex-a-power**

CUTS INSTALLATION COST

KEEPS MAINTENANCE LOW

GIVES MAXIMUM BUSWAY FLEXIBILITY

Because Trumbull LVD FLEX-A-POWER® is made in pre-fabricated units, you save money with this system these three ways.

The units are easily and quickly put together . . . no special engineering skill is required for installation. This means that many expensive time and labor costs are eliminated for a *lower "installed cost."*

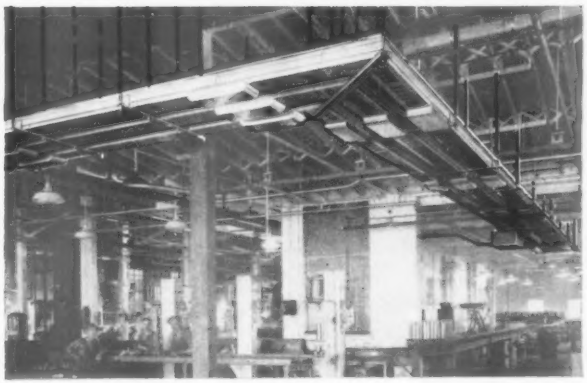
Not only is LVD pre-fabricated, but it is pre-engineered so that you can predetermine electrical performance before actual installation. This advantage is an important factor in minimizing voltage drop and in keeping machine efficiency high.

LONG-LIVED MATERIALS —

Another advantage — LVD FLEX-A-POWER materials do not deteriorate even under the most severe operating conditions, thus assuring years of satisfactory service *without costly maintenance repairs.*

ADAPTABLE, "TAKE-APARTABLE" —

LVD FLEX-A-POWER is readily adaptable to any power distribution problem you may have. Fast to install, its convenient "take-apart-ability" allows you to relocate your LVD system without replacing a single part!



Learn more about the many advantages of LVD. Write for Circular TEC 152 today. THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC

TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

Noralyn Phosphate Mine of International Minerals and Chemical Corporation, near Bartow, Florida. Reynolds *Lifetime* Aluminum Industrial Corrugated roofing and siding used on conveyor, tower and processing building. Installed by Guarantee Waterproofing Co., Atlanta, Georgia.

FLORIDA'S LARGEST PHOSPHATE MINE USES REYNOLDS *Lifetime* ALUMINUM INDUSTRIAL CORRUGATED

"ALUMINUM makes the best roofing and siding," says International Minerals and Chemical Corporation.

Reynolds .032" thick, extra-deep Corrugated has exceptional strength, is rust-proof and corrosion-resistant. Protective painting not necessary. Maintenance practically nil. In addition, aluminum's radiant heat reflectivity keeps interiors cooler in summer, more economical to heat in winter. Easy to apply over any purlin. Reynolds also manufactures all accessories for complete installations.

Reynolds engineers will gladly work with you on any new construction or building repair problems. Call on them. **Reynolds Metals Company,** Building Products Division, Louisville 1, Ky. Offices in 32 principal cities.

Reynolds Metals Company
Building Products Division
2007 So. Ninth St., Louisville 1, Ky.

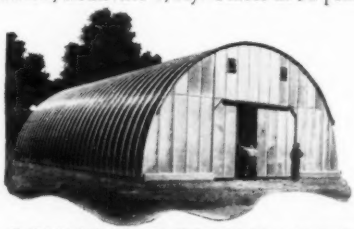
Please send full information on:

☐ Reynolds Industrial Corrugated
☐ Reynolds Alumi-Drome

Company_____

Address_____

Your Name & Title_____



REYNOLDS "ALUMI-DROME"
all-purpose prefab!

All aluminum. Patented all-bolt construction. Basic unit 36' x 60', length variable by 6' sections. Wide choice of door and window arrangements.

IF YOU SEE RUST YOU KNOW IT'S NOT ALUMINUM — REYNOLDS *Lifetime* ALUMINUM BUILDING PRODUCTS

WORLD'S LARGEST PRODUCER OF ALUMINUM BUILDING PRODUCTS

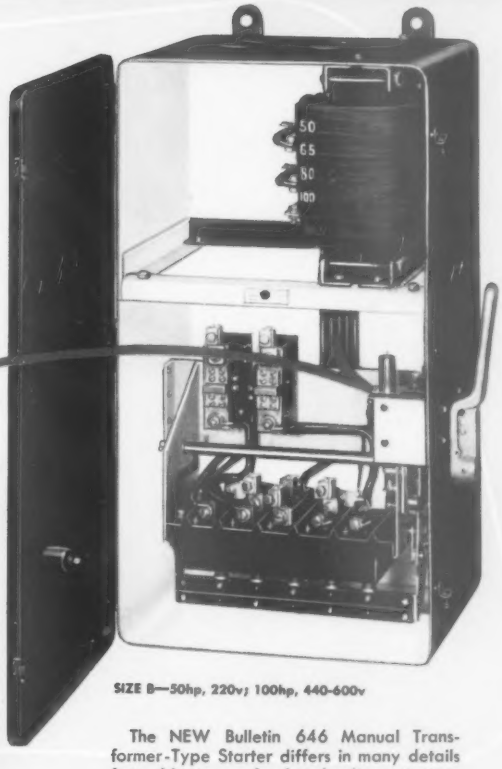
NEW

Bulletin 646

Manual Transformer-Type Reduced-Voltage Starter

Here is the first outstanding improvement in manual transformer-type starters in twenty-five years. It is a worthy addition to the Allen-Bradley line of motor controls.

An unusual feature is its adjustable time delay, which prevents careless operators from switching the motor too quickly to full running voltage. Many other features are described on the next page.



SIZE B—50hp, 220v; 100hp, 440-600v

The NEW Bulletin 646 Manual Transformer-Type Starter differs in many details from older types of reduced-voltage starters.

Time-tested developments . . . like Allen-Bradley double break, silver alloy contacts . . . assure long, trouble-free service. See next page for further details.

Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wis.

ALLEN-BRADLEY

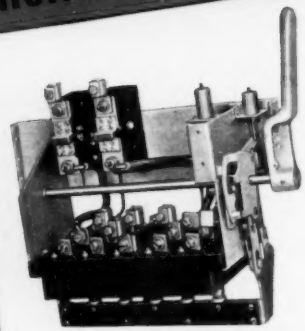
BULLETIN 646 TRANSFORMER-TYPE STARTER

QUALITY

TURN
see next page

EXCEPTIONAL FEATURES of the

Bulletin 646 Manual Transformer-Type Starter



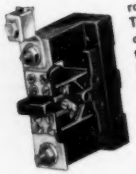
TIME DELAY SWITCHOVER

The Bulletin 646 switching mechanism is a simple, mechanical linkage operated by a two-position, manual starting lever. When the lever is pulled forward, the switch mechanism moves the contacts into the "Start" position. This permits the motor to accelerate at reduced voltage.

An interlock, under dashpot control, prevents the starting lever from being thrown into the "Run" position until the motor has accelerated for several seconds. This timing is adjustable to suit varied starting conditions.

No-voltage protection is also provided by a magnetically operated hold-in latch. Man, motor, and machine are fully protected against accidents and damage from line failures.

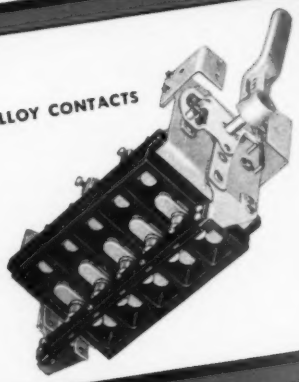
DEPENDABLE OVERLOAD RELAYS

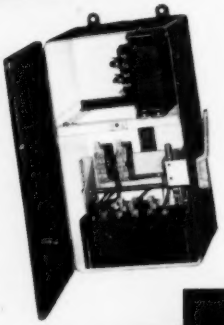


The accurate, reliable overload relays operate on the soldered ratchet principle. They remain reliable in operation, even after long inactivity. Thermal elements available for any load. Contacts are pure silver.

DOUBLE BREAK, SILVER ALLOY CONTACTS

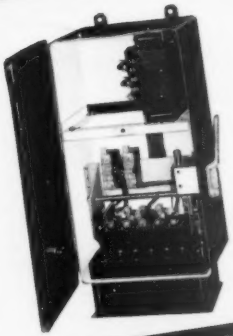
Starting and running contacts are mounted in a molded contact block. Double break, movable contacts are attached to copper spanners, spring-mounted on an insulated rocker arm. In the starting position, the movable contacts bridge the motor and reduced voltage contacts. In the running position, they bridge the motor and line voltage contacts. Easily accessible for inspection.





CAN BE SUPPLIED WITH OIL-IMMERSED CONTACTS

For installations requiring oil-immersed contacts, Bulletin 646 Transformer-Type Starters can be supplied with an oil tank, inserted through the bottom of the enclosure. The tank is suspended on threaded studs, which serve as hangers when the tank is lowered. Since contacts immersed in oil deteriorate much more rapidly than when operated in air, air-break starters are preferable for most applications.



Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.

TURN
see front page

Send for Bulletin 646

ALLEN-BRADLEY

Reduced-Voltage Starters for Squirrel-Cage Motors

QUALITY

SAFER, QUICKER, EASIER MATERIAL HANDLING

Single Post Platform Hoist

Wayne Lift in Newspaper Plant

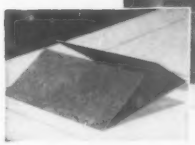
Tilting Loading Dock Ramps

Easy to Handle Heavy Rolls

Cut Handling Costs

INCREASE PRODUCTION WITH WAYNE INDUSTRIAL HOISTS

"BETTER MATERIAL handling offers industry its biggest opportunity to cut production costs and to increase productivity," says Factory Management and Maintenance, which devoted forty-seven pages in January to this subject. Investigate what it can do for you. Let Wayne engineers help you design the proper equipment to assure better handling of material in your plant. There's a Wayne Hydraulic Hoist for every requirement. Write for more information.



Wayne Lift Sidewalk Type

Two Post Platform Hoist

MAIL *Now!*

THE WAYNE PUMP COMPANY • FORT WAYNE 4, INDIANA
521 TECUMSEH STREET

Please send folder and other information on Wayne Industrial Hoists. I am interested in _____.

NAME _____ ADDRESS _____

CITY _____ STATE _____

AIR COMPRESSORS • HOSE REELS • POWER WASHERS • BULK PUMPS

Fenders

Radio Cases

You can do almost anything with versatile

u.s. Royalite

Sinks

Seats

Trays

Pallettes

Ash Trays

NEW, TOUGH SYNTHETIC COMPOSITION LENDS ITSELF TO COUNTLESS APPLICATIONS

Royalite is not a plastic, nor is it rubber. It combines the best qualities of synthetic rubber and plastic.

Royalite can be formed into simple or complex shapes; sawed, sheared, drilled, punched, sanded, sewed, cemented, polished. It can be produced in almost any color, in a smooth, patterned or grained finish.

This remarkable composition is now used in hundreds of different ways. It is suitable for mass production or specialty manufacturing, with very low cost forming equipment. The engineering staff of United States Rubber Company will gladly work with you or advise you on any specific application of Royalite you may suggest. Write us.

Check ROYALITE'S Advantages:

- Very high impact strength. Lightweight, non-corrosive. Excellent heat or cold insulator.
- Easily formed into compound or irregular shapes with inexpensive tools.
- In sheets any thickness from .0312" to .500".
- Any color available, solid throughout its entire thickness.
- Good dielectric qualities.
- High resistance to weather elements, and to gasoline, oils and commercial cleaners. Won't warp, chip.

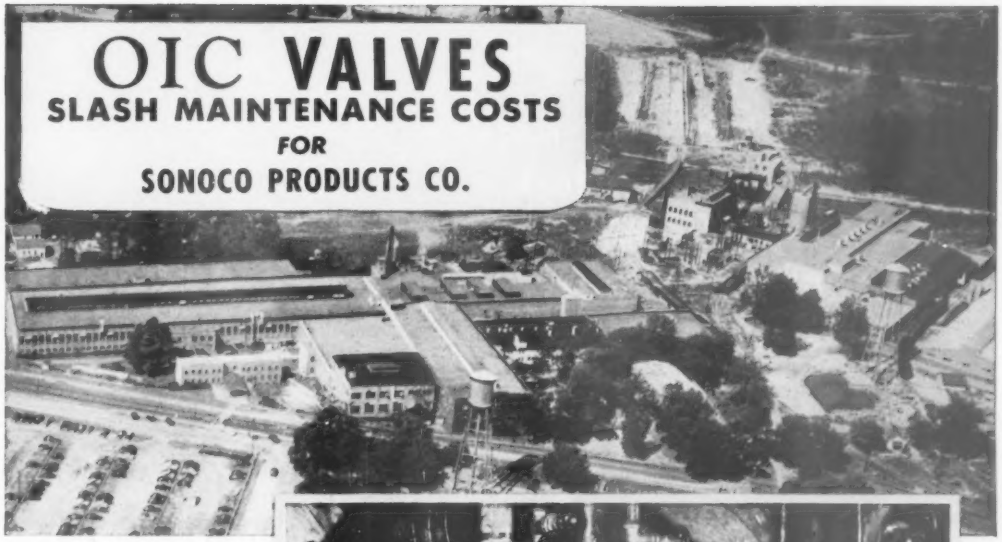
US

UNITED STATES RUBBER COMPANY

Serving Through Science

2638 Pulaski Road North, Chicago 39, Ill.

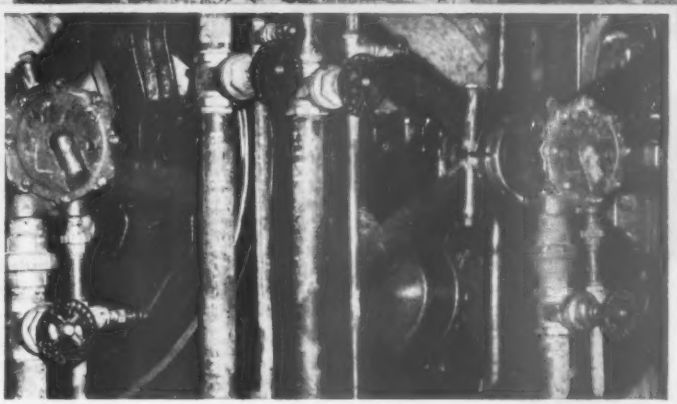
OIC VALVES
SLASH MAINTENANCE COSTS FOR SONOCO PRODUCTS CO.



In the Hartsville, S. C., plant of Sonoco Products Co., OIC Valves play an important part in the manufacture of such paper specialties as textile cones, mailing tubes, drug cans, electrical tubes, fuse tubes, spools and paper mill cores.

•

Most of the small valves shown here on a Sonoco paper machine are 2-inch size. Other OIC Valves, in a wide variety of trims and sizes, are used on lines for such varied services as Paper Stock, Paste, Steam Power, Process Steam, Compressed Air, Water, Fuel Oil and Air Conditioning Equipment.



SONOCO, one of the nation's leading manufacturers of paper specialties, has learned that OIC Valves cost less, over the years, than any other valves. Sonoco's own long-kept maintenance records furnish the proof!

Reasons? Plenty!

OIC Valves feature heavier construction to control pressures and stresses safely! Their streamlined design protects the flow from turbulence. Leakproof joints guard against pressure drop. Wedges of heavy I-Beam design control the flow with positive action. Integral body ribs are precision-designed — effectively reduce vibration and wear.

All these and many more outstanding features tell why Sonoco and hundreds of other leading valve users find OIC the "Pace-Setter in Valves"!

0-349-15

SEND FOR YOUR FREE COPY OF OIC'S VALUABLE VALVE CROSS REFERENCE CHART

Easy to use — saves you time and money! Simply check the number of the valve you wish to replace, look in the chart, and you'll find the right OIC valve. Write to The Ohio Injector Co., Wadsworth, Ohio for your free copy.

OIC

SETS THE PACE IN VALVES

STEEL • IRON • BRONZE

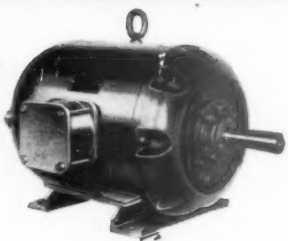
wherever motor hazards lurk... Specify WAGNER PROTECTED MOTORS

Do you use motors in locations where dirt, filings, moisture, splashing liquids, acid fumes, explosive gases, or other motor hazards lurk? No matter how severe the operating condition, Wagner has the right motor for your purpose—adequately protected against such hazards. Five types of Wagner protected motors are shown below.

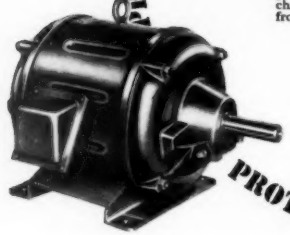
• PROTECTED • PROTECTED

1. Wagner Totally-Enclosed Motors . . .
PROTECTED against dust, dirt, abrasives, steel chips, filings, acid fumes, and other harmful elements that may damage the windings and bearings.

2. Wagner Explosion-Proof Motors . . .
PROTECTED to prevent explosion in locations where gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas are manufactured, used, or handled. Approved by Underwriters' Laboratories for Class I Group D hazardous locations.



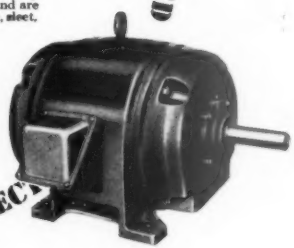
PROTECTED



3. Wagner Drip-Proof Motors
PROTECTED to keep dripping liquids, falling metal chips and other particles from entering the motor.

4. Wagner Splash-Proof Motors . . .
PROTECTED against splashing or dripping water, oil, or other liquids. They are widely used in exposed outdoor locations, and are completely self-protected against ice, sleet, snow and rain.

5. Wagner Chemical Plant Motors . . .
PROTECTED to resist the action of acids, fumes, moisture and other harmful elements encountered in chemical manufacturing.



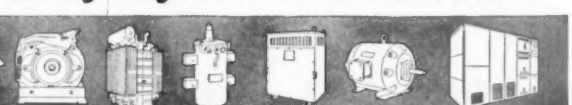
PROTECTED PROTECTED

Bulletin MU-185 gives full information on the complete line of Wagner Motors. Write for your copy today.

Wagner Electric Corporation
6412 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

Consult Wagner Engineers on all Electric Motor Problems

Wagner Electric Corporation
EST. WE 1891

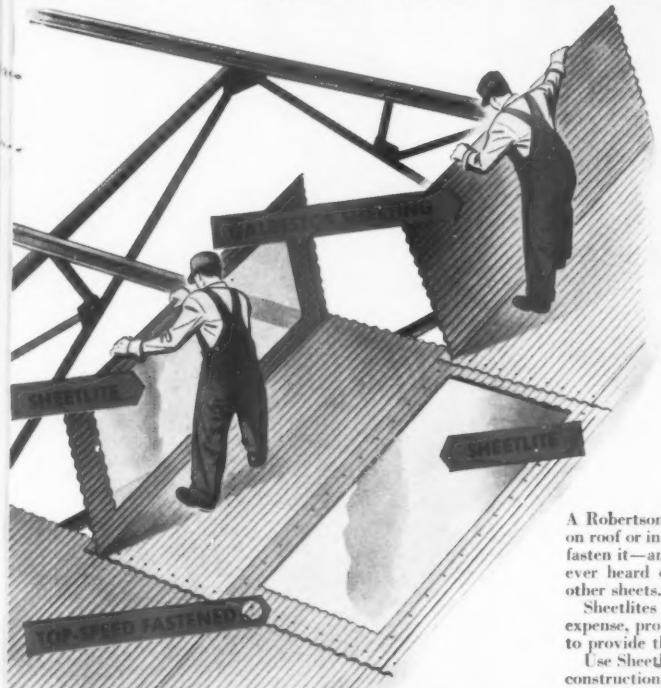


BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

M49-18

A NEW ROOFING TECHNIQUE GIVES YOU



- better lighting
- faster construction
- lower building cost
- lower operating expense

A Robertson Sheetlite is glass in an aluminum frame. You can install it on roof or in side wall like a piece of corrugated sheet metal. Lay it down, fasten it—and you have a piece of roof with a window faster than you've ever heard of! It doesn't leak. Fastens directly to steel skeleton or to other sheets.

Sheetlites give you maximum natural daylighting, save operating expense, provide better, shadowless lighting. Install as many as you need to provide the desired candle power.

Use Sheetlites for repairing your roof, correcting bad lighting or for new construction. Sheetlites can be Top-Speed Fastened*.

Top-Speed Fastening is a new and safer method of attaching roofing and siding. All hazardous interior scaffolding is completely eliminated, the work being done entirely from outside. This explains the tremendous saving in time. *The same number of men in the same time can apply twice as much material!* They use a new group of tools and new, patented drive screws. Your own men can use Top-Speed Fastening. Top-Speed Insulating* is another Robertson application of the new building principle—all work is done entirely from outside, eliminating interior scaffolding. Insulation goes in place before the roofing and siding sheets. Time saved by Top-Speed Fastening is so great it pays for the labor of installing insulation! This way *you can insulate merely for the cost of the material.*

Two catalogs: SHEETLITES and TOP-SPEED FASTENING give the details, explain the savings. Remember, building cost is only two things: erection time and materials. YOU CAN CUT TIME with these new methods. Write for the catalogs.

*patents pending

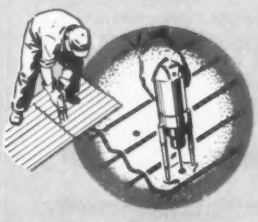
H · H · ROBERTSON CO.

2418 Farmers Bank Building
Pittsburgh 22, Pennsylvania

Offices in 50 Principal Cities
World-Wide Building Service

TOP-SPEED FASTENING SYSTEM

DRILL HOLE



FASTEN TO FRAME

New, patented drive screw attaching sheet to purlin

FASTEN SIDE-LAPS

New, patented side-lap drive screw attaching sheet to sheet

WRITE FOR BOOKLET

This is the first genuine development in building methods in 43 years. All work done from outside. No interior scaffolding.

NEW MANUAL

contains latest information on

FIBERGLAS*
GLASS-BASE FOR
ELECTRICAL INSULATING MATERIALS

The new 36-page "Fiberglas Glass-base Electrical Insulating Materials" manual is just off the press. Contains performance charts, graphs, photographs and descriptive material on the complete line, including: Tape, Varnished Cloth, Saturated Sleeving and Varnished Tubing, Yarn, Cord, Braided Sleeving, Cloth, Laminates, Mica Combinations and Wire and Cable Insulations.

Features selection factors—suggested uses—and other pertinent information that will help you determine the best Fiberglas-base material for a specific job. Lists the manufacturers of these insulating materials and tells you where you can buy them in your locality.

If you manufacture, design, use, repair or sell electrical equipment you need this new manual.

FREE—WRITE TODAY for your copy. Address: Owens-Corning Fiberglas Corporation, Textile Products Division, Dept. 861, 16 E. 56th St., New York 22, New York, or call one of the Owens-Corning Fiberglas Corporation Sales Offices, located in 27 leading cities.

*FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

OWENS-CORNING
FIBERGLAS
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ELECTRICAL INSULATING MATERIALS

the SOURCE you can depend on for all your Piping Needs

How CRANE is set up to give you better service

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

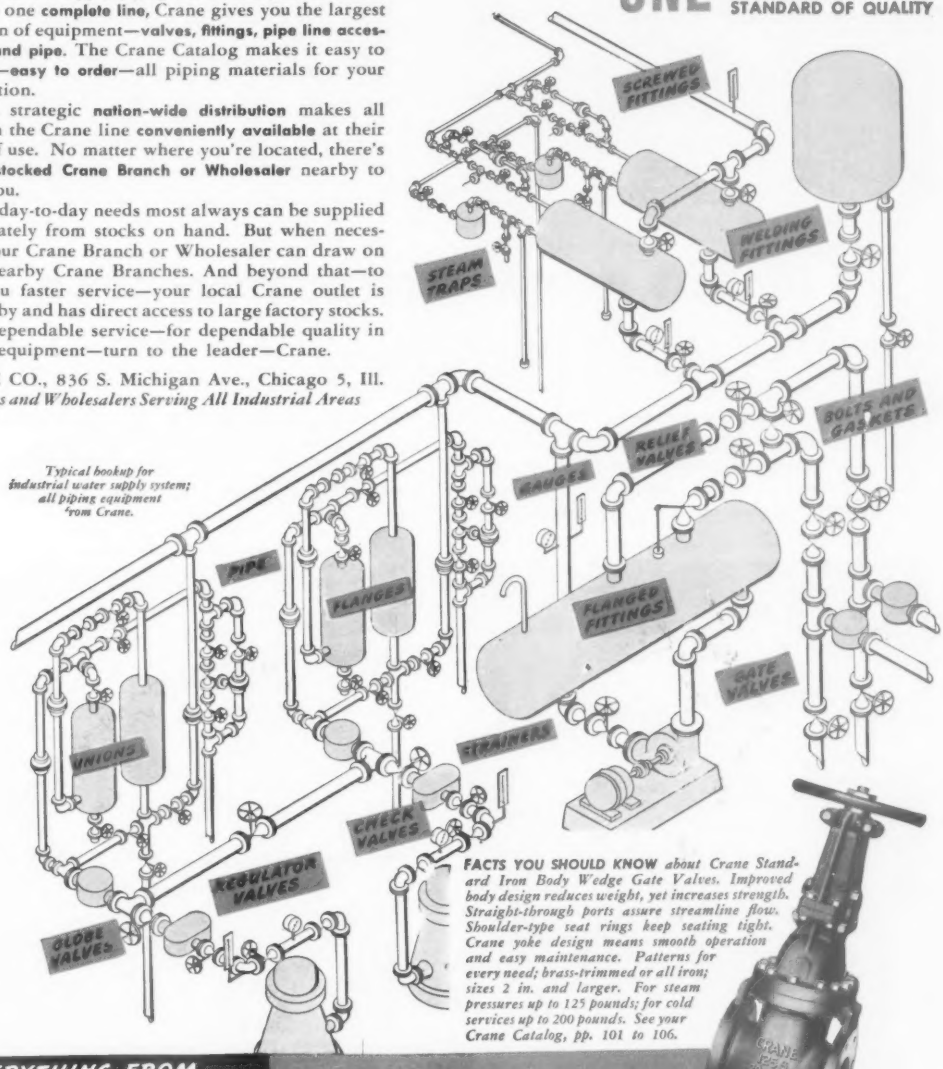
Take the water supply piping shown here, for instance. First, in one **complete line,** Crane gives you the largest selection of equipment—**valves, fittings, pipe line accessories, and pipe.** The Crane Catalog makes it easy to specify—**easy to order**—all piping materials for your installation.

Next, strategic **nation-wide distribution** makes all items in the Crane line **conveniently available** at their point of use. No matter where you're located, there's a **well-stocked Crane Branch or Wholesaler** nearby to serve you.

Your day-to-day needs most always can be supplied immediately from stocks on hand. But when necessary, your Crane Branch or Wholesaler can draw on other nearby Crane Branches. And beyond that—to give you faster service—your local Crane outlet is backed by and has direct access to large factory stocks.

For dependable service—for dependable quality in piping equipment—turn to the leader—Crane.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



Typical hookup for industrial water supply system; all piping equipment from Crane.

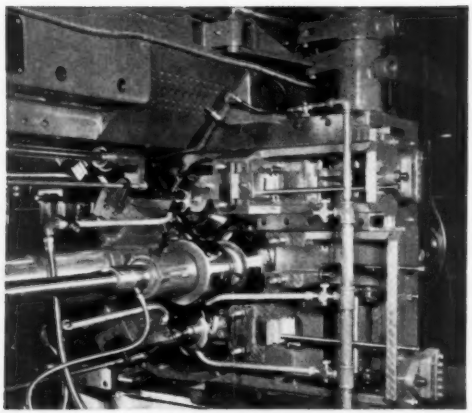
FACTS YOU SHOULD KNOW *about Crane Standard Iron Body Wedge Gate Valves. Improved body design reduces weight, yet increases strength. Straight-through ports assure streamline flow. Shoulder-type seat rings keep seating tight. Crane yoke design means smooth operation and easy maintenance. Patterns for every need; brass-trimmed or all iron; sizes 2 in. and larger. For steam pressures up to 125 pounds; for cold services up to 200 pounds. See your Crane Catalog, pp. 101 to 106.*

EVERYTHING FROM . . .

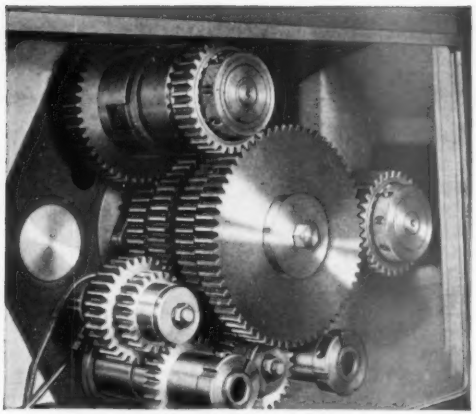
VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM



Full Swing for Main and Auxiliary End Slide Standard and Special Tool Mountings



Cone "Full-Choice" Open End Attachment Drive

IS HALF A LOAF BETTER THAN ONE?

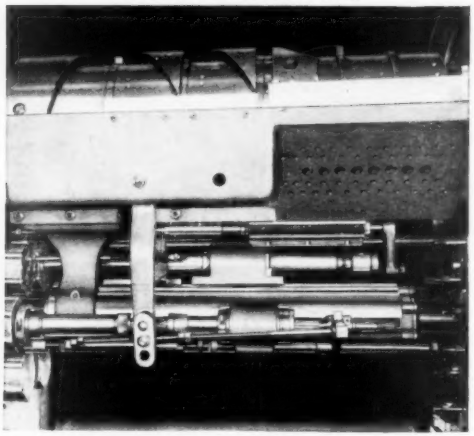
Machine capacity can usually be measured by tooling accommodation. The facility available to handle the job will determine a machine's dollar value.

Lack of a "full choice" accommodation of tooling positions for endworking tools and attachments can be a costly handicap to a multiple spindle automatic. The inability to swing to full collet capacity die heads, hollow mills, trepans, and internal necking tools, can limit a machine's usefulness on many jobs from zero up. Like half a loaf — better than none, but much less than one.

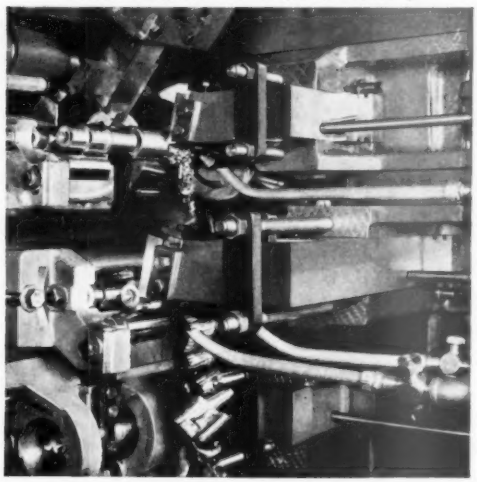
The "full choice" tooling accommodation of Conomatic cross slides, main end slides, auxiliary end slides and endworking attachment drive positions, are worth checking.

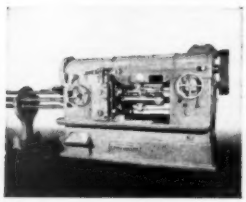
Write to Cone for Buyer's Chart which lists overall requirements of Multiple Spindle Automatics.

"All-Position" End Attachment Mounting



Standard Forming Slide and Auxiliary Cross Slide Facility





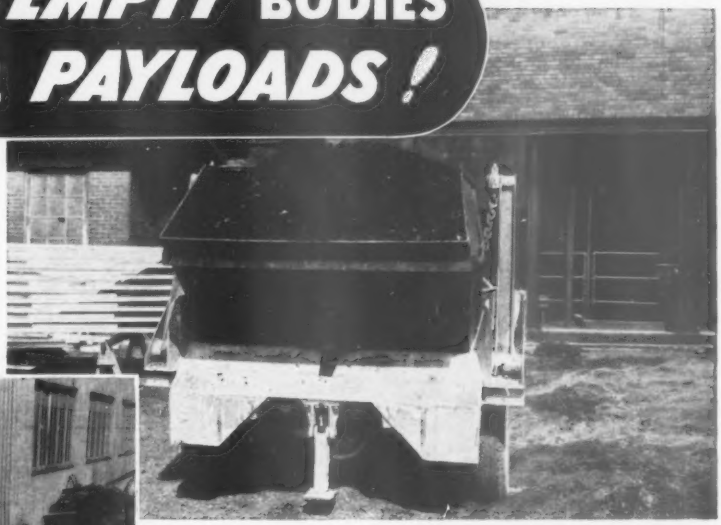
A comparison with ALL Automatics will lead you to

#6

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

LEAVE THE *EMPTY* BODIES HAUL THE *PAYLOADS!*



This Load Lugger-equipped truck was busy on another mission when the pulp was being loaded.

Liquid-tight garbage type bodies are used to collect waste paper, ice cream cups and trash that is thrown down by employees going into the plant.

Slag collected at the bark-burning boiler and fly ash from the stacks is about to be dumped into a nearby fill. This is start of dumping operation. All controls are handled by the driver in the cab.

THIS PAPER CONTAINER CORP. SAVES 2080.47 MAN HRS. EACH MONTH

One Load Lugger and 29 detachable truck bodies replaced 5 trucks and 13 men in this Louisiana plant—eliminated unnecessary rehandling of materials and time wasted by loading crews and drivers. Monthly savings in labor alone (2080.47 man hours) paid for this equipment in record time. All bodies are preloaded at the various collection points—*as the materials accumulate*—waste lime at the pulp mill, chemicals at the alum plant, fly ash and slag at the power house, shivers and bark under the wood conveyor, sawdust at the carpenter shop, refuse in the yards, etc. One man, the driver of the truck equipped with the Load Lugger hoisting unit, handles everything—picks up a loaded body, hauls and dumps it, or relocates the load. Four types of bodies were designed to handle over 15 materials for this plant.

HOW YOU CAN CUT YOUR MATERIALS HANDLING COSTS

Our competent engineers will make a comprehensive survey which might reveal costly delays in your plant. Send for our representative to determine how many man hours you can save. No obligation, of course.

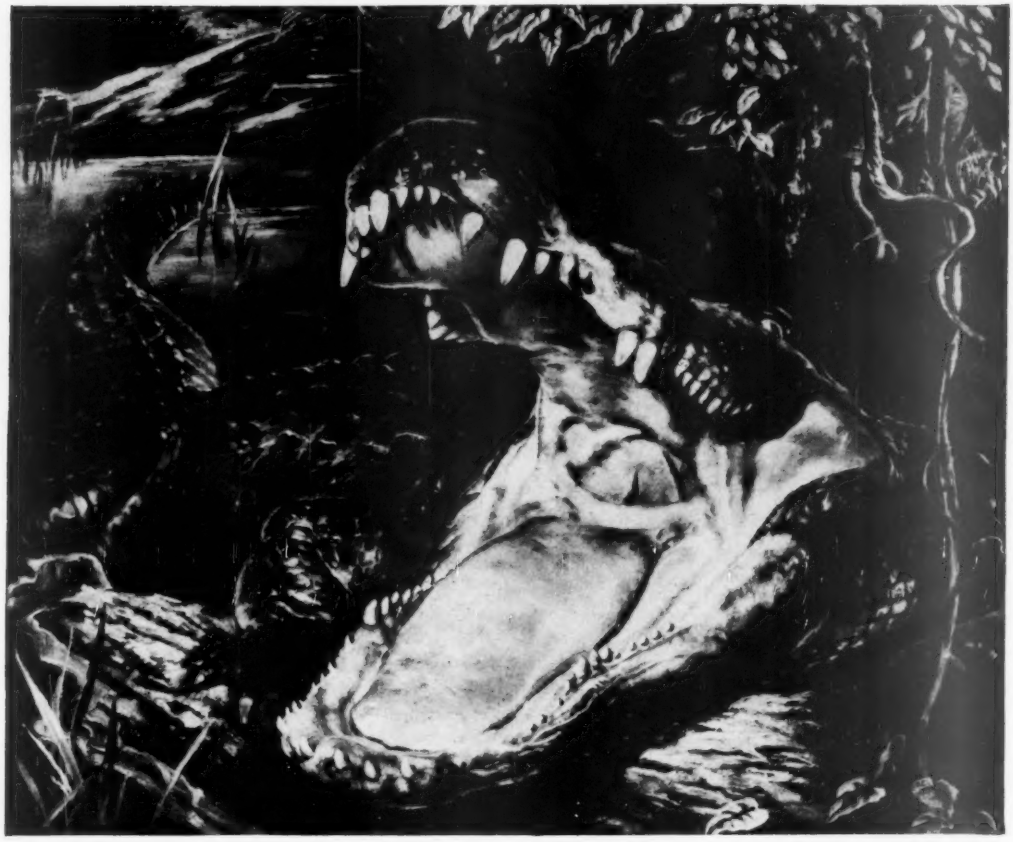
Brooks LOAD LUGGER TRADE MARK REGISTERED
ONE MAN OPERATED

IT WILL PAY YOU TO INVESTIGATE

BROOKS EQUIPMENT & MFG. CO., 350 DAVENPORT RD., KNOXVILLE, TENN.
Please send literature showing wide range of Load Lugger uses ☐
Please send your representative to survey our plant ☐

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____

BROOKS EQUIPMENT & MFG. CO. • 350 DAVENPORT ROAD • KNOXVILLE, TENN.



Taking the bite out of weather

Koppers Bituplastic* Protective Coating does not "alligator." This is a major improvement over many types of coatings commonly used to protect exposed metal, concrete and masonry from the ravages of weather.

For when a protective coating "alligators" . . . breaks down into those unsightly cracks like the scales on an alligator's back . . . portions of the underlying surface are frequently exposed, and protective efficiency is lowered.

Koppers Bituplastic guards against that. It's also waterproof, fire-retardant, virtually odorless and tasteless. It withstands extremes of temperature. It's an effective vapor seal over insulation . . . and can be used as a bond between the surface to be insulated and the insulation itself. Koppers Bituplastic completely covers exposed surfaces with a thick, tough, quick-drying coating that provides effective, lasting protection against corrosion and deterioration.

To meet varying corrosive conditions, Koppers makes a complete line of Industrial Protective Coatings. Koppers representatives will gladly recommend the Coatings that will give your plant the best protection—that will hold your maintenance expense to a minimum. Write us, without obligation, for new Protective Coatings Catalog.

*T. M. Reg. U. S. Pat. Off.

Koppers Industrial Coatings are sold through Industrial Distributors

KOPPERS **PROTECTIVE COATINGS**

KOPPERS COMPANY, INC., Dept. FM-6, Pittsburgh 19, Pa.

DEPENDABLE PITTSBURGH

bronze globe valves

Featuring:

1. The Bronze Packing Nut.
2. Graphited Molded Asbestos Packing.
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Pattern for modern lighting

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Easy, comfortable seeing in this assembly shop results in faster, more accurate work, improved employee morale. Fluorescent fixtures arranged in a grid pattern, with two 40-watt General Electric fluorescent lamps in each fixture, give 80 footcandles of illumination on the work areas, cut shadows to a minimum.

Modern, improved lighting like this, made possible with General Electric fluorescent lamps, is a sound investment that pays off in increased production and profits.

See your General Electric lamp supplier today. Always specify G-E fluorescent lamps for all replacements or new installations. Quality is assured by more than 480 tests and inspections!

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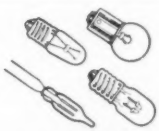
GENERAL ELECTRIC

Whatever Lamps you need

FILAMENT
All types and wattages for every lighting need.



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Glow and filament types, for instrument panels, etc.

REFLECTOR
Spot and flood types. Self-contained reflector.

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For drying, baking, curing and other heat processes.

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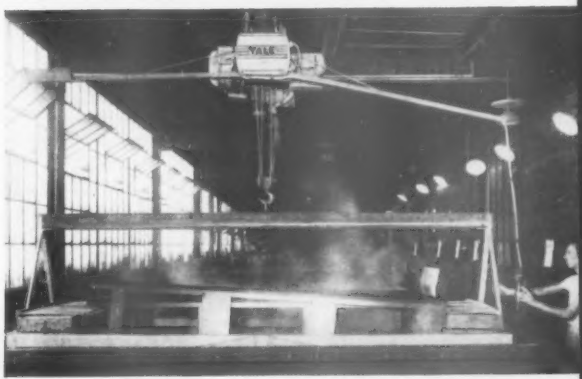
TAKE HIGH HANDLING COSTS FOR A "RIDE!"

Handling adds nothing but cost to your products. By eliminating wasteful *rehandling*, you cut those costs substantially.

How to do it? Simply integrate efficient material handling machinery with the most practical handling system for *your* operations. Here's proof of what cost reductions can be made: a rubber company now saves $80,000 a year in a single department. Material transfer costs were lowered 25% by a publisher. $5.00 to $7.00 per ton was cut from handling costs by a casting manufacturer.

Whatever you lift, move and weigh, Yale Hoists, Trucks and Scales will give you handling economy you never thought possible. These cost-cutting tools handle enormous tonnage at a pace that keeps receiving, processing, warehousing and shipping at the peak of efficiency. They save a tremendous amount of human effort, improve safety conditions, and contribute greatly to worker morale.

See your telephone book for the name of the nearby Yale representative. Or write direct to headquarters for help in taking your handling costs for a "ride." Do it today.



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TOOLS THAT KEEP INDUSTRY "ON THE MOVE"

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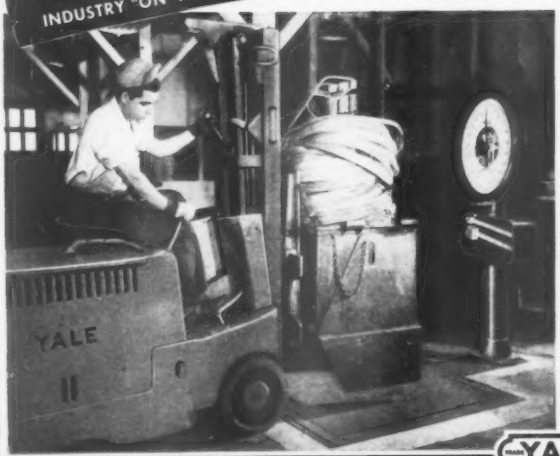

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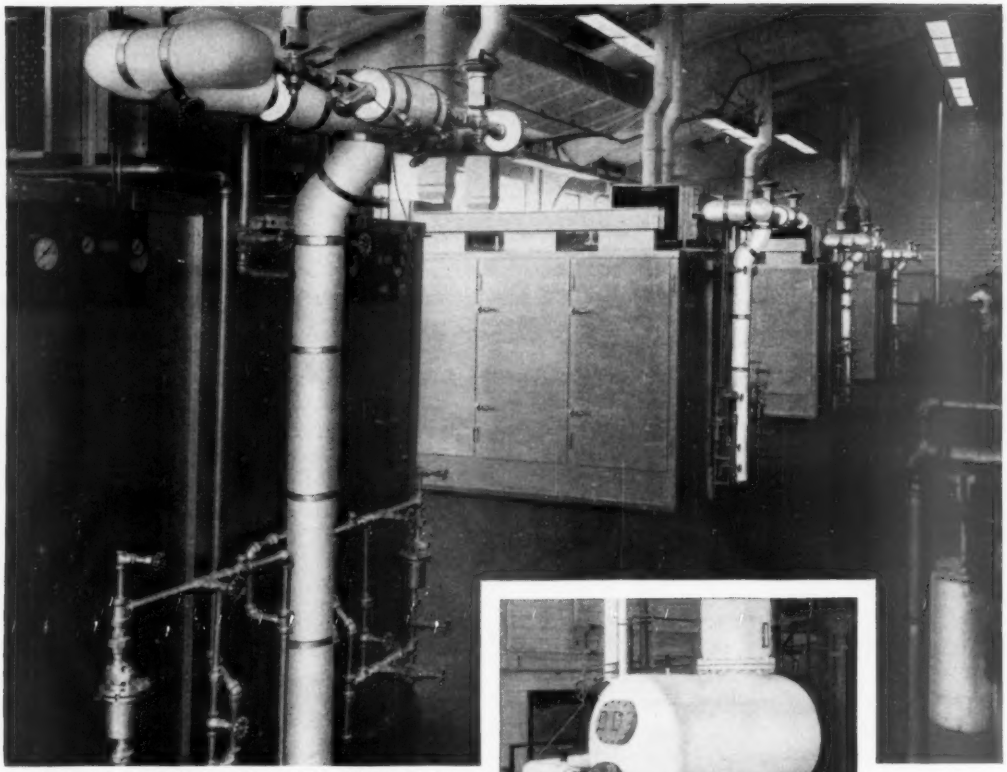
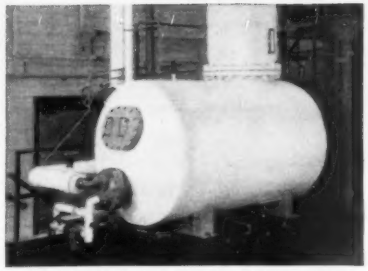


Drying closets in plant of The Bayer Company Division of Sterling Drug, Inc., Trenton, N. J. The 60-lb. steam pipes are covered with K&M "Featherweight" 85% Magnesia Insulation, 2 inches thick, canvas pasted and banded.



Reclaim Solvent Still in the Trenton plant. Tank and tower are insulated with 2-inch 85% Magnesia Block, finished with asbestos cement; steam line with 2-inch thick 85% Magnesia; return line with Standard Thick 85% Magnesia.

Where temperature control is important—

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos

K&M "Featherweight" 85% Magnesia Pipe Insulation

In the Trenton, N. J. plant of The Bayer Company Division of Sterling Drug, Inc. temperature control is vastly important. Insulation of *known* dependability is essential.

K&M "Featherweight" 85% Magnesia Pipe Insulation was used because in a wide variety of applications it has proved efficient and durable. It combines the high insulating properties of basic Carbonate of Magnesia with the proper amount of clean Asbestos Fibre as a binding element. It is extremely light in weight, easy to apply, fire-proof, mechanically strong. And is supplied in a wide range of sizes and weights.

K&M Distributors, located strategically throughout the country, are experts on the application of K&M insulating materials. Let them help you make important savings in your plant. Write us for further information.

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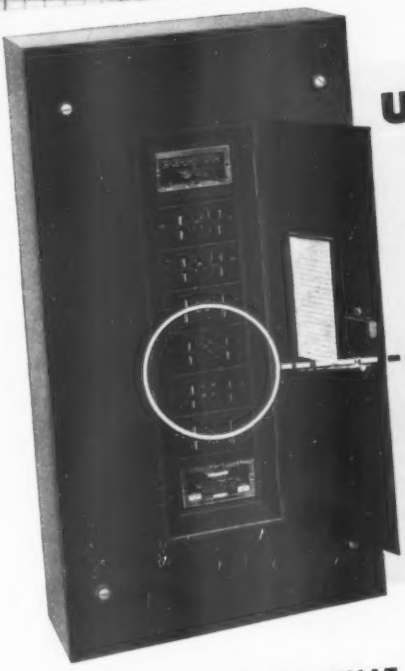

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1. SWING OUT...

2. OR LIFT OUT...

3. ATTACH WIRES...

4. "PLUG-IN"

HERE ARE FEATURES THAT REALLY COUNT:

✓ **Thermal-Coilless ∧ Magnetic**—Multi-breaker unit gives 2-way circuit protection. Thermal element holds harmless momentary overloads but trips on continuous overcurrents before wire insulation is overheated. Magnetic element trips quickly on "shorts" to localize damage.

✓ **Simple to Add or Change Circuits**—Four circuit Multi-breaker units have "Plug-in" feature. Any combination of 15, 20, 30, 40, or 50 ampere circuits available "off-the-shelf." Dummy units can be inserted to anticipate future requirements.

✓ **Easy to Wire**—Multi-breaker units can be swung or lifted out to attach wires. Approved connector eliminates "looping."

✓ **Smaller Size**—Compact Multi-breaker unit permits more circuits and larger wiring gutters without increase in overall panel size. Better utilization of wall and column space.

Illustrated NMO Bulletin gives complete information on the new Panelboards. Address Square D Company, 6060 Rivard St., Detroit 11, Michigan.

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GREATER PRODUCTION

LOWER UNIT COSTS

There is a supply point for Texaco Products and Lubrication Engineering Service near your plant

LOOK at the map above. It shows at a glance that regardless of where your plant is located, you can quickly contact a Texaco Wholesale Distributing Plant—"headquarters" in your area for top-quality lubricants and lubrication engineering service to increase your production and lower your unit costs.

Texaco lubricants are "engineered" for specific lubricating jobs. Texaco Lubrication Engineers are *practical* men with many years of field experience—in plants of every size and type, in every industry, in all 48 States.

Thus, when a Texaco Lubrication Engineer comes to work with your production men, he can draw on all of Texaco's vast experience to see that the *right* lubricants are used *right*—that all your equipment gets the effective lubrication necessary for peak production efficiency and economy.

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TEXACO

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Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

"Give us the tools..."

YOUR ONLY CHANCE of Getting Ahead

Where is the "brave new world" so glowingly promised us by the politicians during and after the war? We were told then that postwar America would live 50% better than it had before. Why has that promise faded out? Why are men today discouraged and frustrated?

We have not yet made good 1944's promises because the *American worker turns out no more in an hour now than he did in 1941.* We are getting more total production in our country – but only because we have more people working. Not because each one of us is producing more. American industry's ability to turn out more and more goods – with less of each worker's time and effort – has been stymied for eight long years.

Progress has been blocked because in some cases workers have not been willing to work as hard as they did before the war. In other cases unions restrict the use of labor-saving machines and methods. In some places obsolete building codes and ordinances prevent advances. In still other cases progress has been blocked by collusive practices between unions and manufacturers or operators.

But the biggest block to progress is the fact that our industry in the United States has been unable to provide our workers with all the new tools and equipment that they need.

Increasing productivity – that is, each one of us turning out more in each hour of work – is the key to higher living standards. Productivity depends directly upon the kind of tools workers use. His tools, more than anything else, determine how much a worker can turn out; and what his paycheck will buy depends in large part on what he turns out–not on how long or how hard he works.

Look what happened in our country in the forty years from 1900 to 1940. Productivity of the United States *more than doubled.* It doubled because:

Business investment in capital equipment gave workers new tools – tools that had three and one-half times as much power –

So – Americans' living standard rose almost 50% while the average work week was dropping from 61 to 43 hours.

Industry did continue to raise its output per man hour, even in the depressed 1930's. But it did it because, with unemployment widespread, companies used only their most efficient equipment. *Actually the great depression saw industry fall far behind in the job of providing workers with new tools.*

Then came World War II. Few new tools for peacetime industry were produced. *As a result of depression and war, the U.S. fell behind in needed investment in new industrial facilities by more than $100 billion.*

Since the war business has spent almost $60 billion for new plants and equipment –

But the greater part of that money went to *expand* production to take care of the needs of our bigger population, and to *replace* plants and equipment that were worn out and ready to be junked at the end of the war.

continued on next page

Only a small fraction of the $60 billion went to *modernize equipment* – the equipment that increases efficiency and improves productivity of the individual worker.

Right now industry is desperately trying to do the job of increasing efficiency of machines so that each worker can turn out more.

McGraw-Hill's national survey of Business' Needs for New Plants and Equipment shows that manufacturers plan right now to spend in the 5 years ahead three-quarters of their capital funds to replace and modernize facilities. The biggest part of the more than $55 billion industry plans to spend on its plants and equipment will go directly to improve efficiency of the individual.

If industry can carry through its plans – and expand them as it would like to and as it must do – the U. S. can catch up on its depression-war-time lag in progress within a few short years.

If American industry is allowed to earn the money to buy the equipment, it can raise the American standard of living 50% in our generation – in the next 25 years. No other nation can promise its people that much – and deliver on the promise.

But the promise can only be fulfilled by American industry. Wherever you turn, industry has dramatic new ways of doing things. Using oxygen by the ton, steel makers are increasing production from blast furnaces by 20%. New high-speed machine tools are doing three times the work of 1940 tools. A new coal-mining machine will multiply a miner's daily output 10 times. Diesel locomotives do the work of three steam locomotives on many jobs.

New products – and larger production of standard products – are already making their impact on American life. Two million Americans will get new television sets this year. Automatic washing machines, electric dishwashers, and home freezers are easing the daily tasks of thousands of housewives. Millions of homes that did not have them before the war now have telephones, automatic heat and refrigerators. Frozen foods, nylon clothing – these and many other things coming along now – will shape the *real* new world for Americans.

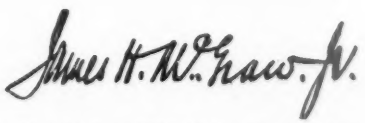
But industry can provide them only if it can keep on investing at least $15 billion a year now – and more in future years – in new plants and equipment.

Today Washington is taking a course which, if pursued, will make that investment by industry impossible. Government spending now strains our resources to the limit, and more multi-billion dollar spending proposals are being piled on. *But government spending cannot improve American living standards.* It never has, and it never will. Increasing government spending *now* will only block progress, because the government proposes to pay for its plans by taxing away the profits industry is using, and must continue to use, to improve and expand its plants and equipment – our only hope for greater worker productivity and higher living standards.

Better living can only be paid for with more production. And we can only get more production by increasing productivity – by each one of us producing more for each hour of work.

The first thing is to get the production – in peace and in war – for better living – for security. Industry is planning to provide it – and is using $13 billion of its profits this year to improve and expand its facilities.

The only sensible, the only safe national policy is to make it possible for American industry to do its job – not to terrorize private industry with proposals of ruinous taxation and paralyzing controls and threats of nationalization. For American industry is not a thing apart from the American people any more than is government. American industry is the lifeblood of the American people and whatever makes industry do its work better contributes more to the common welfare than a bureaucratic government can ever hope to do.



President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

Employee Communication—Difficult, But Vital

IT TAKES TWENTY SERMONS to make a convert. So the preachers decided years ago. If that is a true figure in the field of religion, what must be the comparable figure in the field of employee communication?

In the one instance, the subject submits himself to the sermon. In the other he must acquire the information largely as a matter of duty.

Communication Didn't Register

A company that I know well makes a continuous effort to keep employees informed of management policies and practices. This company deserves *A* for effort. Recently its personnel department sampled office employees to see how resultful those efforts had been.

The findings were disappointing. Too many employees (from a third to a half) knew too little about how they would be paid, for holiday and Sunday work; for Saturday work; for straight overtime. The same was true in regard to vacation policies and what would happen in cases of accident and illness.

The sampling was not large, so the percentages cannot be conclusive. But it seems surprising that anyone should not know just how he would be paid for extra work, what would happen to his pay envelope if he were sick, what he could do about his vacation.

Again: A check-up on a training program was reported in *Personnel Journal* by Robert C. Rogers of Richardson, Bellows, Henry & Co. As a part of the program, management representatives of a company studied the company's labor contract. "The exact wording, meaning, and intent of every provision was covered in detail. Where possible, relevant (non-contractual) company policies, minutes of negotiations, pertinent state and federal legislation, and case histories were systematically introduced into the discussions."

Tests carried out during the first week after conclusion of the conference showed that, on the average, the students knew only about two-thirds of the provisions of the contract. The author's comment is that "no contract can be administered accurately and uniformly throughout the plant when the primary people involved don't know what it says and do not interpret it in the same manner."

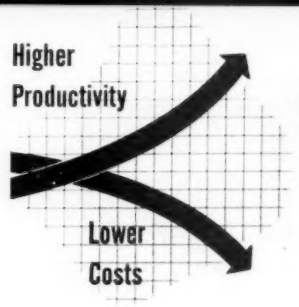
More Companies Ought to Check

The two check-ups referred to deal with isolated, but important, cases of management-employee communication. They are made the subject of this discussion in the interest of stimulating further checking on the results of attempts to get information to employees, no matter by what methods.

There is a further objective, which is to warn, "Don't become despondent if the information you are dispensing seems to take hold slowly." In this matter of employee communication, no one knows how many sermons are required to make a convert.

L. C. Morrow

THE SECOND



ARTICLE IN FACTORY'S

Tell Employees Why

1 **DOES IT REALLY** make any difference what employees know and think about cost reduction and its blood brother, quality improvement?

2 **WHAT HURDLES** is management up against in terms of employee, union, and supervisory attitudes?

3 **WHAT DOES MANAGEMENT** have to *know before* it starts a communications campaign?

4 **WHAT DOES MANAGEMENT** probably have to *do before* it embarks on a cost reduction program which will pay off in results through employee cooperation?

5 **HOW DO YOU GO ABOUT** selling a cost reduction program?

6 **WHAT ARE THE CHANNELS** *of communication* and the best available media for getting the results management wants?

FRED RUDGE • PRESIDENT, FRED RUDGE, INC., NEW YORK

1. Does Employee Thinking Make a Difference?

The answer to this first question is pretty well summed up in the comment of one employee: "We've got to carry the ball. The least management can do is show us which way to go."

Today management is acutely conscious that lower costs can mean lower prices, that lower prices can mean more sales, more production, and more work for everybody. Yet, in a mill where a conveyor system eliminated the need for two men, the union insisted that these two men be kept on in their old job classifications. A New England plant found itself slapped with a grievance for eight hours' pay for one man because maintenance workers, on a Sunday, had moved two buckets of sand a distance of 150 yards. These are only two of thousands of similar instances. Every company can list its own examples of the wide gap that exists between management's sure knowledge of what must be done to keep down costs and employee and union behavior that is costly.

Here's what some employees have to say (all quotations are word for word, as stated to interviewers during recent attitude surveys in the electrical, textile, mining, machine tool, and other industries):

"I'd been making this part for a long time when I cut my hand and couldn't keep on the work. So they showed me how to inspect—and I had to inspect some of my own work. I had to throw a lot of it out. If I'd known what the inspectors would be looking for, I could have made them better in the first place."

"One man saved the company about $2000 one day and the next day he almost got laid off for turning in 20 minutes' overtime."

"We put in a new machine, then ripped it apart and sent it away. It probably cost the company $500 to

Costs Must Be Cut

do it. We can't get a small raise, yet they waste lots of money by not planning big things."

"They changed construction of this particular item four or five times, got just short of production, and then the whole thing was called off. What *that* cost the company I couldn't even guess!"

"We're all in this business together. Our pay depends on whether this mill is successful. I'd like to help make it a success."

Employees themselves say that *what they know* helps them do a better, more efficient job. They indicate a *desire* to cooperate. But they register a strong conviction that management itself throws away money by poor planning, lack of planning, and downright misjudgment as to what is really important.

Clearly, it makes a whale of a difference—in dollars and cents—what employees know and think about cost reduction.

2. What Hurdles for Management?

Management is up against many tough hurdles in terms of employee, union, and supervisory attitudes.

Right off the bat, many employees refuse to believe management means business when it attempts to reduce costs:

"My company makes a lot of noise about it, but that's all. They put stuff on the bulletin boards, but we don't even read it."

"The union claims layoffs are pre-negotiation steps by the company to scare them—it sure puts the company in a bad light."

"Cut costs? They don't know how, except by cutting people off the payroll."

"I think union-company negotiations have something to do with it. These layoffs are aimed to weaken the union."

"Management," say the unions, "is not doing a good job of managing. Why should it tell the worker to do a better job until it mends its own fences?"

Unions distrust management's motives and techniques. They tell their members:

"With prices still up and jobs down, industry's profit grab is paying off at the worker's expense."

"Industry is attempting to speed up in order to produce the same amount of goods with increased profits by cutting down on jobs."

Supervisors believe management bungles, that it cannot hold its own against the union:

"We don't get the word from the top. How can we do a good job in our own departments?"

"It works this way: When the company tries sincerely to explain anything, my workers are willing to listen. But the union sees everything from a different viewpoint. Whenever management opens up, the union hops on what it says, whether it is right or wrong. After a while, management is inclined to throw up its hands and quit telling us anything."

"There's too much changing of mind at the last minute. It shows there's no planning in advance."

"Sometimes I wonder if top management knows just what's going on—what we are doing."

These comments are typical of the "climate" management encounters when it sets out to put its house in order by reducing costs. They stress an important point—that the problem of getting employee cooperation, whether for cost reduction or any other purpose, is not new and special. *It's the same old problem of good management, whether times are good or bad.*

Perhaps the picture painted so far is a dark one, but there's still another cloud on the horizon. Any effort to cut back costs puts additional pressure on both management and workers, pressure that is likely to stir insecurity, fear, and suspicion. Read this:

"It's happened every time. If you figure out a way to do a job better, somebody is out of luck."

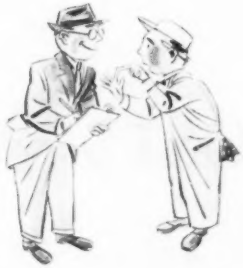
"Sure, when you hear there is just so much work to go round, you figure everybody will be better off if you take it easy for a change."

These are attitudes, of course, that can—and frequently do—knock a cost reduction program into a cocked hat.

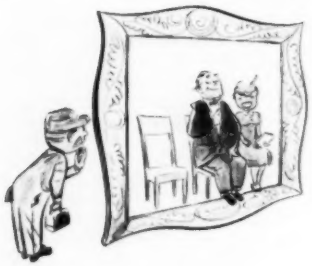
On the two following pages, key points in telling employees why costs must be cut. Text continued on page 70

4 KEYS TO EMPLOYEE COOPERATION

Your employees can be
a **BIG HELP** in
CUTTING COSTS
But...



To approach them successfully,
you must first find out
WHAT'S ON THEIR MINDS



The **RANK** and **FILE** should
feel they are
PART OF THE PICTURE
But....

Have you taken the steps
to **SHOW** them they
really **ARE**?

IN YOUR COST REDUCTION PROGRAM

Good foremanship is the **KEY** to effective **COST REDUCTION**

But...

You mustn't keep your foreman **IN THE DARK** about plans, policies, procedures..and **HIS OWN AUTHORITY**

COST REDUCTION is bound to be unpopular with **SOME PEOPLE**

But...

STRAIGHT FACTS will show **ANYBODY** why costs **MUST** be cut

(*Continued on next page*)

3. What Must Management Know?

It's a basic principle that you can't talk to a man about what's on *your* mind, and get the benefit of his earnest consideration, without first finding out what he is thinking, then either doing something about it or at least relating what you have to say to those things that concern him most.

Joe—naturally enough—is interested in Joe. This basic principle was brought home in no uncertain fashion to one company where a group of employees had been called together to hear about a new standards system and to be allowed to ask questions about it. Management's representatives did a beautiful job. They stated their case with force and logic. It would have been hard to see how there could be any reaction except one of enthusiastic interest.

And what happened?

In the "Q and A" period that followed, employees ignored the main subject almost to a man. At that moment they had more pressing questions on their minds.

"What's going to happen to us when we're too old to work?"

"We've been getting a rumor there's going to be some layoffs. How about that?"

Give an employee the chance to talk about what's on *his* mind and here are the kinds of things you get first of all:

"What I really want to know is whether my job is going to last."

"What if I get sick, or some member of my family does? This company hasn't even got a hospital plan."

"When you have to do overtime work they deduct 10 cents from your pay if you want to call your wife!"

"If a man does good work, he should be told so. That doesn't happen around here and never did. The foremen just push the men around."

"All I want is the straight facts. But I don't think I am getting them."

These are highly personal problems, rooted deep in every human being's instinct for survival and satisfaction on the job. But it is too often true that management fails to recognize these problems or take them into account. And employees' feeling that management "doesn't care about people" is perhaps the biggest hurdle of all to getting them into the cost reduction act:

"They treat an old machine better than an old employee."

"The company's not interested in people. They're just interested in profit."

"They think so much about their production record they forget about the men."

Yes, management must know—and in specific terms—what its employees are thinking. *Remember, if Joe doesn't feel he is on the team, he isn't going to be even a little bit interested in management's thinking.*

Labor-Management Cooperation

Management must understand, too, the position the union is apt to take on management's cost reduction proposals, and recognize that what its employees think (not only about cost reduction but about the hundred and one other things that affect their attitudes toward their company or their jobs) is conditioned by what the union tells them.

Particularly when it seeks to cut costs through employee cooperation, management must win union support for its main objectives. In the short term, these objectives run head on into conflict with union aims and interests because they affect the security and content of individual employees' jobs—changes in standards or methods and even elimination of jobs altogether.

In the long run, it can be proved that these factors increase stability and security. Yet the fact remains that if management is to win the support of its employees, or even be understood, it must avoid a position where every statement it makes, every proposal it advances, is countered by union argument.

If union support is desired (and goodness knows it is desirable) management must be prepared:

1. To have the union leaders share in the program.
2. To be ready, if the cost-saving effort is successful, to see to it that the employees get their fair and equitable share out of the results achieved by their cooperation.

4. What Must Management Do?

Let's look at some of the things a company should do before launching a cost reduction program which it expects will pay off in results through employee participation. The specific actions will vary company by company, but these seven general principles, perhaps, apply to all.

1. Find out, or recheck, through research, what supervision and employees are thinking—what is uppermost in their minds.

2. Appraise, or reappraise, company policies and practices (in the light of facts revealed by research).

3. Revise basic policies as required, or create them where they do not exist.

4. Correct such operating procedures as may call for immediate attention.

5. Set up methods of teaching policies, procedures, and the handling of people at all management levels, down through foremen.

6. Organize, to the fullest extent possible, the participation of management, employees, and union leaders, and a free exchange of ideas from the worker level up as well as from top management down.

7. Let the people know. Reveal to employees and then to the plant community the achievements and constructive aims of management giving employee cooperation and union support fair credit.

Here, of course, is the framework of a broad program to better human relationships, to foster understanding, and to enlist the participation and cooperation of all elements. Does that mean that such a program must be carried out in full before anything is done about cost reduction? Not at all. But a start must be made. Intent must be made clear. Evidence of sincerity must be established.

Good Intentions Necessary

Some managements, smart enough to know that there is employee unrest and dissatisfaction, hesitate to do the basic-attitude research job.

"It's bad enough here already," they say, "without stirring up a hornet's nest by asking our supervision and our employees what they think and what they want."

This is somewhat akin to trying to treat a severe wound without examining it. Management must know "chapter and verse" before it can possibly hope to get employees to work with management at reducing costs and improving quality. Further, management has to find out plant by plant, because experience proves over and over that, even with two plants run by the same company in the same town, problems and attitudes vary considerably.

Get Employees on the Team

An early phase of any program should be to get employees themselves, as well as all levels of supervision, into the act as members of the team. As soon as employee and supervisory groups can be encouraged to think, and to contribute the results of their thinking, about a few matters uppermost in their minds, so soon will they be ready to consider factors relating to cost reduction in a spirit of mutual interest.

Let's take a look at Company X, where management was keenly aware of the hurdles it faced in getting full understanding and cooperation of its employees, yet needed them badly to cut costs and increase quality in the face of stiffening competition and falling sales.

Company X took the first vital step that every company must take to find out what its employees and its management really think. It directed that a survey be conducted that would get down on paper the opinions and feelings with which it had to deal.

"If we are going to change our direction," management reasoned, "let's get a compass to find out just which way we should go."

Management also realized that getting frank and unreserved opinions would be difficult if not impossible if attempted through usual company channels. A reputable consulting firm was commissioned to conduct the survey and make its report on a confidential and objective basis.

Supervisors were saying:

"We have to get in line with the people to punch the clock. It just puts supervision in an ugly frame of mind."

"Supervisors are on the same level as sweepers. We should be on a bi-weekly payroll."

"Supervisors are like sergeants without authority. They're by-passed by the union."

"Supervisors are robbed of initiative by staff departments. They should have more say."

"A guy's afraid to make decisions for fear he won't be backed up."

"A foreman has no authority. He can't deal with issues raised by the men."

Workers were saying:

"The lighting is very bad. They could at least wash the windows."

"I hate to use the washrooms, they're so dirty."

"They ought to have a woman janitor for the women's washrooms so they can be cleaned during shift time."

"Why can't we come to work at 7:00 a.m. instead of 8:00, and get off an hour earlier during the summer? All of us would like that. We never get time to shop now."

"Some operators only make 25 cents a day more than helpers. Who wants the extra responsibility for that amount?"

"The foremen push men around. They always talk to you in an insulting manner."

The consulting firm's experienced technicians went to work interviewing a representative cross-section —some hundred rank-and-file employees, half as many members of the supervisory force, all members of top management, and enough people in the plant community to get an outside viewpoint.

The talks were conducted on a "free-hand" basis, with no preconceived notions of what the findings would be. Respondents were assured of anonymity. They were encouraged to talk about anything and everything that might be on their minds. Interviews ran up to an hour and a half in length.

The subsequent report revealed, among other things, that:

Management itself was saying:

"The assignment of responsibility is very confusing. It comes up continually and causes friction. There ought to be a more definite description of everybody's job."

"One department doesn't know what the other is doing. They'll say to hell with everybody else—but you can't pin it on them."

"We'd like a little more chance to talk things over rather than just take orders—more constructive planning along with the criticism."

"We don't know much about the company's plans —what they do, what they intend to do—like cutting production. The company has no policy. It makes it up as it goes along."

"The trouble is, this is sort of a one-man show. Everything is run from the top. People get promoted, but they never take their thumb out of the pie."

"One of the fellows was sick. The foreman gave him hell for reporting to work. Told him to get the hell home until he was able to do a decent job."

"There's too much partiality around here. If you're on the good side, you're okay, but if not you get the worst of it."

"Lines of authority aren't followed by top management. They raise hell with the men without seeing the superintendent or foreman—and the men may be right."

"They don't know enough to be able to explain anything. Nobody likes to take orders from a man who doesn't know what he's talking about."

These were just a few of the things Company X found out. But they pointed the way to some things the company could do immediately, and some that it could undertake as part of long-range plans:

1. A series of meetings has been instituted to talk out, to replan, and to clarify lines of authority.

2. A study was immediately started on broadening the services of the personnel department and adding to its staff.

3. Some of the working conditions bothering the employees were immediately corrected and management explained why it couldn't change others.

4. A communications program has been launched, letting supervisors and other employees know that management understands what people have in their minds, that management identifies itself with the

aspirations of its people, and that management is trying as hard as it can to do what is right.

Granted that the problems take time to solve. Granted that changing management people from ingrained practices of the past is an evolutionary process. Granted that results come slowly and painfully. It is nonetheless encouraging to all concerned that management cared enough about its people to study their interests and desires—and is taking steps to do a better job.

These things aren't going to be done overnight, but to the employee, any evidence that management will realistically face such problems is welcomed with enthusiasm.

5. How Do You "Sell" Cost Reduction?

Let me re-emphasize that the package management has to sell to its employees is the *over-all* package of good management. Within that concept, cost reduction can be sold—but it can't be said too bluntly that cost reduction by itself is not a salable package.

Comments like these should be kept in mind:

"We're sitting on pins and needles. Everybody is wondering who's going to have a job and who isn't."

"The trouble here is lack of security—fear of a layoff—among supervisors as well as the rank and file."

"How would it hurt a company to let us know if we are going to have a job—and if not, to let us look for a job, or even to help us?"

These statements are evidences of the natural insecurity and fear that arise in a time of production cut-backs and reductions in force—pressure points in the labor-management atmosphere in which a cost reduction campaign must succeed.

On the one hand, management knows that in the long run the ability to cut down costs results in a better competitive position, more sales, more production, and more jobs—in stability and continuity of employment.

On the other hand, employees and the union fear immediate results, chiefly a reduction in the number of jobs available through improved efficiency and better methods.

The issue, both with management and with employees, is security. And it is management's job to demonstrate that only through company security—through the ability to improve efficiency, to make progress and to set its house in order so that it can meet competition—can the individual security of its employees be assured.

Sell Security

Security is the ribbon with which our "good management" package can be neatly tied. But it will be a complete package only if it contains, in addition to measures to reduce costs, ways and means of softening the immediate impact of necessary readjustments.

If there must be layoffs, a prime case in point is the layoff procedure itself. The forthright approach is simply one that registers a concern for the employee's welfare and makes sure that his rights and privileges, as well as any investment he has made or any job benefits he enjoys, are protected as far as it is possible and practical to do so.

Certainly the layoff procedure should include an exit interview in which reasons for the layoff are fully explained. There will be questions on the employee's mind, and they should be answered as simply and as completely as possible.

What about his insurance? His medical and hospital benefits? Where can he get a job? What are his chances of being recalled to work?

These questions and many others are of urgent importance to anyone facing unemployment. No company could answer all of them. But an effort should be made to answer as many as possible.

6. What Channels of Communication?

Let's talk from now on in terms of *how* to tell employees about cost reduction—remembering, of course, that it is part of the larger package of good management, and anything we say about setting policy, gaining participation, and reaching people with information applies to other objectives as well.

Naturally, the following suggestions are based on the assumption that management has found out what its people know and don't know, like and don't like, and understand or fear.

A. Identify your interest with workers. Assuming, as we have said, that you know the thinking of your people, let them understand that you are fully aware of their problems as they see them.

Toward that end, one method that has worked out well in practice has been an easel presentation to all supervisors, graphically portraying each of the major points with which supervision and employees are concerned. Such a presentation, because it serves visually as well as orally to drive home the major points, reassures the audience that management is not sitting in an ivory tower far removed from an understanding of employee problems, but rather is thoroughly conversant with "the little man" and his point of view.

This easel presentation, self-evidently, must address itself to the specifics which research has revealed are important to the listener group. Whatever these specifics, whether a misunderstood wage incentive plan, or a feeling of insecurity, or dissatisfaction with the fairness of treatment by supervision, or any one dozens of other possibilities, they must be recognized openly and candidly by the management group. It isn't important at this early stage of the game for management to try to come up with solutions, but rather for management simply to make it crystal clear that it has full knowledge of what the other guy is thinking and why.

Immediately following the discussions with the supervisory group, there should be similar information circulated to all employees. In a smaller company it is best to do this in meetings on a face-to-face basis. Where this is not practicable because of the size of the group involved, a series of written communications is in order. These should not attempt to cover too much ground—perhaps as many as four letters may be required to cover what could be ef-

fectively encompassed in one half hour's face-to-face meeting. It is recommended, too, that such written communications be personally addressed, and be sent to the employee's home, where the family of the employee will share the opportunity to study the material.

B. Provide positive leadership. Management's second step is to make known what it has to offer—hence why it makes sense for the individual to go along with the management program.

Certainly there is no failure on the part of union or political leaders of all shades of opinion to make known what they feel *they* can do to better the lot of the individual. Nor any lack of articulateness among them as to the paths they think lead to security and a better life for all. Necessarily, therefore, there is competition for the attention and faith of employees. And to the extent that others promise pie in the sky, or short-term benefits that ignore long-term costs, management's task includes meeting the challenge of such ideas with a program of its own.

Will your employees—and mine—take their leadership from management if we offer it? The answer depends on how perceptively—and thoroughly—we make our position positive and clear.

Of at least one thing we can be sure—if business does not make known the goals that it seeks to achieve for itself and its people, the leadership our people *do* follow will not be ours.

C. Create understanding, set goals. It isn't enough to talk in a global fashion about hard times, reduced sales, and needs for more production. Your people will want to know how much sales are off; if competitors are beating you out, and why they are; if more productivity is needed, and how much more and in what departments.

Here's how one company worked out the problem:

Relating its cost reduction program to quality improvement, it studied the records of each department over a period of time, selecting the month for each department in which quality was highest and imperfect production at a minimum. After making sure that no unusual factors were involved, it set up specific objectives for each department based on the department's best month.

Here was a realistic program based on actual achievement. It didn't ask that a department do "10 per cent better," but merely that it do as well as it had already proved it could do.

Supervisors of each department were asked: "What was good about your best month? How did you do it?" The result was a challenge, not a threat—and, incidentally, a program with all the odds in its favor.

D. Foster participation. It may seem far quicker and easier for a few in top management to direct them to spend time and effort in meetings, but all ideas are needed, and sometimes the very best ones come from unexpected sources. More important, any idea will work out better at the action stage if a number of people have been in on it from the beginning and can honestly feel that it is at least partially theirs.

Participation is a sales problem. Its full success rests on making people *want* to take part. They must be pulled into the picture and kept there—because they are sold on what is being done, and convinced that it has a purpose definitely related to their own interests.

E. Explain the why and how. A dramatic example of the participation that can be obtained when employees know reasons and are given a part in making decisions was reported by Dr. Alfred J. Marrow, president of the Harwood Manufacturing Corporation, in describing an actual experiment conducted in a situation where job methods and procedures were to be changed.

Two groups were selected, an experimental group and a control group. The control group went through the usual routine. The production department modified the job and a new piece rate was set. Then the workers were advised of the changes.

Before any changes were made for the experimental group, however, a group meeting was held with a committee of operators and need for the changes was clearly presented. General agreement was reached that savings could be effected.

Management then suggested a plan for arriving at the new methods and piece rates. The committee approved it and chose operators to be specifically trained. This cooperative attitude was carried over into the meetings of the entire experimental group, from which many suggestions were received.

The results were significant. Said Dr. Marrow:

"The control group dropped below their rating on the previous job and showed almost no progress. Resistance developed almost immediately after the changes. There were expressions of aggression against management, deliberate restriction of production, and lack of cooperation with the supervisor. Seventeen per cent quit in the first 40 days. Grievances were filed, though when the rate was checked it was found to be a little loose.

"The experimental group showed a dramatic recovery. After a slight drop their production climbed back to the levels prevailing before the changes were introduced. Progress continued thereafter to a level about 14 per cent higher than the production before the change. Members of the group worked well with their supervisors, and no indications of aggression were observed. There were no quits in the first 40 days.

"Where arguments, threats, and persuasion had failed to enlist cooperation, participation with management in research, group discussion, and group decision was successful."

Good Management Is the Key

Millions of people *want* to do a better job. Given the reasons *why* and the opportunity to help decide how, they can and will.

Management's purpose must be to provide a clear statement of the reasons and an opportunity for all to participate.

Cooperation cannot be built on a single issue. It can be built in a general framework of good human relationships. And it can then be put to use to solve the multiple problems that face all business today.

Cost reduction is merely one of those problems. In solving it, good management—which gives full recognition to the human factors—is the golden key.

On the next six pages, specific examples of how sixteen companies are telling employees why costs must be cut

CASE STUDIES FROM 16 COMPANIES

Mike Good debeads a truck tire that would have put $70 into our cash drawer if it could have been sold to a dealer. Something went wrong in building or curing, and it will be sold as scrap for 1½ cents a pound—about $1.55

Irving Yound bales scrap tire fabric that costs 40 cents a pound to produce, but sells for 1½ cents as scrap. This bale means a loss of $173.25. About half of that could have been saved by more care in handling or cutting

1 · SEIBERLING RUBBER COMPANY—AKRON, OHIO

Although placing first reliance on well-informed supervisors to tell employees why costs must be cut, Seiberling also makes effective use of its employee newspaper. In addition to pictorialization and explanation of the annual report (1948 net profit, 1.6 per cent of sales), the case for cost reduction is reduced to terms of individual operations. An example of this technique is shown in the illustration (above) of a portion of a page from a recent issue of "The Seibeneer."

2 · FORD MOTOR COMPANY OF CANADA, LTD.—WINDSOR, ONT.

Laying it right on the line in a letter to employees, President Douglas B. Greig said not only that the competitive situation required lower costs, but that if any wage increase was to be granted it would require even greater concentration on cost reduction on the part of all employees.

To give added emphasis to these words, the employee newspaper reprinted in full the annual progress reports and forecasts made to supervisors by the executive vice president (factors for future leadership), the treasurer (analysis of annual report), and the assistant in charge of manufacturing accounting (next year's operating budget). The amply supported conclusion: *The outlook is bright if employees will contribute unstintingly to increase quality and lower cost of production.*

3 · PITNEY-BOWES, INC.—STAMFORD, CONN.

An incentive system for "service" employees serves as a springboard for telling employees why costs must be cut. Since the determination of the bonus is based on performance against budget, detailed explanations of each month's bonus provide an opportunity to show not only how employees would have benefited immediately from better performance, but why better performance is in the long-run interest of both employee and company.

Quarterly letters from the president to employees also attack directly the problem of cutting costs. An indirect attack is being made in the employee publication. Example: An article titled, "Company's Cost of Living." Illustrations included pictures of many of Pitney-Bowes' high-cost production machines. On each picture was superimposed a price tag, showing the actual cost of the machine in 1937 and its present replacement cost. The article pointed out that such machinery had to be purchased from "profits," and offered as contrast the fact that profit per sales dollar had dropped from 16.3 cents in 1939 to 9.7 cents in 1948.

4 · BELL & HOWELL COMPANY—CHICAGO

Most recent and most direct method of telling Bell & Howell employees why costs must be cut was the address made by President C. H. Percy at the first annual family night. This provided an opportunity to bring the message not only to employees but also to their families, which can have an important effect on the attitude of employees toward their jobs. Cost reduction was not the main theme of the talk but it was discussed thoroughly and objectively. The decline in sales not only at Bell & Howell but in business generally was reviewed and employees and their families were told what efforts would have to be made and what objectives accomplished to retain a reasonable level of efficient operation.

5 · WHITING CORPORATION—HARVEY, ILL.

Prime vehicle for telling employees why costs must be cut at Whiting is the monthly "Town Hall" meeting attended by all employees (FACTORY, January, 1947). In addition to a careful year-end review of company operations there is a month-by-month analysis of performance measured against budgets established for this profit-sharing company (FACTORY, March, 1947). On April 26 of this year, for example, employees were told:

"Our backlog is $8,411,622.98—a reduction of $1,975,876.80 for the year to date. In view of this, the emphasis has definitely shifted from one of obtaining maximum production to one of cutting costs and reducing expenses so that we can get more business. Preliminary budget estimates indicate that our average monthly shipments for our new year will be $1,189,000. If we are forced, by lack of orders, to reduce production to such a figure, under such circumstances, it is apparent that we cannot pay a production bonus during the new year. However, if we are successful in reducing our expenses and costs so that we can operate on this volume of shipments at a profit . . . the wage adjustment should be proportionately higher because the cost of the production bonus will no longer be included in our costs of operation. . . .

"From a manufacturing angle our backlog is already too small to provide balanced loads throughout the various departments. From a sales angle, new business is not going to be easy to get. And from an overall angle, all I can say is that we have reached the stage where there is no alternative but to cut costs and save money, or else go into the red. With our large, outstanding commitments, we've just got to stay out of the red. . . ."

(Only principal conclusions of the report are quoted above; the statistical and operational analysis preceding them would be meaningless in any but the complete form in which it was presented.)

6 · SNOW-NABSTEDT GEAR CORPORATION—HAMDEN, CONN.

A profit-sharing company, Snow-Nabstedt has long had employee cooperation in cost reduction. Three principal methods are used to keep employees well informed:

1. Sales charts on shop bulletin board are kept current on both a daily and a monthly basis. Employees know shrinking sales on a given item mean tougher competition and therefore costs must be lowered in order to meet it.

2. An employee, chosen by his fellow employees, sits as a *regular* member of the board of directors. Through frequent meeetings, this man can keep the entire shop informed of current and long-range problems and planning.

3. High level of participation by employees in regular stockholders' meetings. Through profit-sharing plan, 95 per cent of employees are stockholders in the company.

7 · SUN OIL COMPANY—PHILADELPHIA

Sun is carrying the message to employees direct from top executives. Example: Addressing an employees' rally at Toledo on May 3, President Robert G. Dunlop emphasized the return of stiff competition to the oil industry and the consequent need for cost reduction in all areas.

The annual report, distributed to employees, gave special attention to the problem.

An indirect attack was made through the employees' house organ. A 6½-page article in the most recent issue told in friendly but exhaustive fashion of the March 15 stockholders' meeting. Without dull statistics, the report made clear how the company's fortunes have progressed, and how further cost reduction would benefit stockholders and employees alike.

8 · UNITED STATES RUBBER COMPANY—NEW YORK

Principal activity in this field consists of a series of meetings, started in January, 1948, at which management and union representatives meet to discuss common problems. First meetings were top management with top union officers. Later sessions have involved foremen and local union officers. Most important point covered at these meetings is cutting costs. Company takes union men into its confidence, demonstrates why lower costs are needed to meet competition.

Additionally, story is being told through house organ and films. Example: Annual stockholder report was simplified and presented to employees on slides.

(*Continued on next page*)

Division. a close on Thursday, [illegible] when he

The Boss

During recent weeks a long-established local plant is reported to have laid off more than 2,000 persons. It has been stated that excessive costs caused by too high wages and fringe benefits forced too high prices. The items manufactured could not be sold in quantity at the prices.

Scovill's management wishes to pay fair wages, provide reasonable hours of work with suitable working conditions. At the same time costs must be reduced through efficient operation and increased productivity. Only by so doing can our output be sold, and jobs be furnished our thousands of employees.

A practice is growing to pay for holidays which fall on Saturday. Such payment produces no goods for sale, but must be added to the cost of all goods produced. The total cost of all these non-productive payments amounts to more than sixteen cents an hour for every hour worked during the year.

We must decide whether we want work or unemployment compensation. Too many of Scovill's products are now being priced off the market. The customer is our boss. We will work only so long as he will buy that which we produce.

Frank Ged

9 · SCOVILL MANUFACTURING COMPANY—WATERBURY, CONN.

For well over two years, Scovill management has been telling its employees, through the employee newspaper, that higher costs mean higher prices and fewer jobs, and that lower costs mean lower prices and more jobs. A fairly recent example is the very pointed message reproduced above.

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10 · BRIDGEPORT BRASS COMPANY—BRIDGEPORT, CONN.

Last fall, Bridgeport Brass introduced a ten-point cost reduction program aimed at "increasing efficiency and reducing costs of operation by every fair method we can find." President Herman W. Steinkraus carried the attack directly to employees with a carefully documented, hard-hitting letter that stated the objective forcefully and explained, point by point, exactly why the program was necessary.

Substantial portions of the letter are reproduced below:

Dear Fellow Employee:

I wonder whether you have any idea as to how the items of cost in this business have gone up in recent years. Let's take some of the principal items of material which we use in large quantities. Copper, for instance, cost 12 cents per pound in 1945. Today's price is 23½ cents, or almost double.

Now another class of materials which we buy consists of many different kinds of supplies. For instance, we are the largest users of oil, gas, electricity, and water in Bridgeport. There is no way for us to reduce the amount of copper or zinc which we need in a pound of brass. But it is possible, by more careful use, for us to make savings in these and other supplies of every kind.

Of course the largest factor in our cost in which you are personally interested is the item of wages and salaries. These, too, you know, have gone up steadily during the past three years, and of course during the war years as well. I think you will be interested in reading the following tables, which show the increase in the cost of wages and other benefits over the last ten years.

	1937	*1947*
Average amount we paid to each of our employees for the year's work was	$1.575	$3,098
The total payroll for the year was	5,215,000	16,492,000

The cost of certain benefits for our employees has also gone up at a very rapid rate, as the following table will show:

Vacation pay for our employees cost	64,000	429,000
Paid holidays for our employees cost	00	196,000
Group life insurance, workmen's compensation insurance, and social security taxes were	199,000	620,000
Adding all these figures together, the total cost of benefits was	$263,000	$1,245,000

This gives you some idea of the large amounts of money involved in these benefits for our employees.

The recent wage increase amounts to about $1,300,000 per year and has been only partly offset by increased prices. We have to find methods of improving our efficiency to take care of the balance.

In order to pay for materials and supplies, as well as wages, the company must produce a quite high percentage of its business before it makes a single dollar of profit. So the more we produce, the better for all of us.

The term "profit" really means the earnings for the owners of the business. About 10,000 people have invested some of their money in this business in the hope of receiving a reasonable earning. For the last nine months they have received no dividends because the earnings have been low, and the money has been needed in the business.

Now you may say, "Aren't these things the problems of management, and not our problems?" Yes, they are—but only as the company succeeds can you succeed, so you are vitally concerned that we make this business successful.

You know as well as I do that your job security depends upon the company's successful operation. The way you can help us is by working with us to get greater efficiency and more production. That includes every worker, every salesman, and every individual on our payroll.

We are instituting a program of improving our efficiency and reducing our costs of operation by every fair method that we can find, and we are outlining this program to our foremen and all of the supervisors, in writing.

I am asking you to assist us with making this program successful. Here are some ways in which you can help:

1. Work every day, and save wasted time on the job.
2. Avoid tardiness and absenteeism, which interfere with the efficiency of your department.
3. Reduce spoilage and waste of materials. Use supplies economically.
4. Report to the foreman anything which prevents you from doing your best work. He is there to help you.
5. We welcome suggestions to further this program.

I feel confident that if we will pull together and help each other to do a better job, our program will succeed. The great majority of all of our employees are conscientious, loyal workers who are willing to help us. Those who are not willing to do their share should have no place in this organization, because they hurt the chances of all the rest of us to keep this company strong and protect the future of all of us.

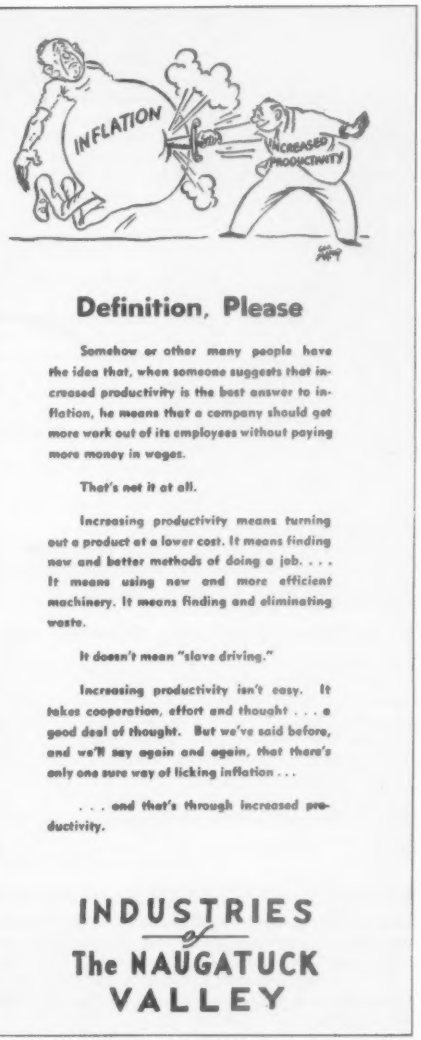
So, when you hear from your supervisors more of the details of this plan, I hope you will help them to carry the plan out, because as you help us you also help yourself and your family.

With best wishes, I remain

Very sincerely yours,

Herman W. Steinkraus

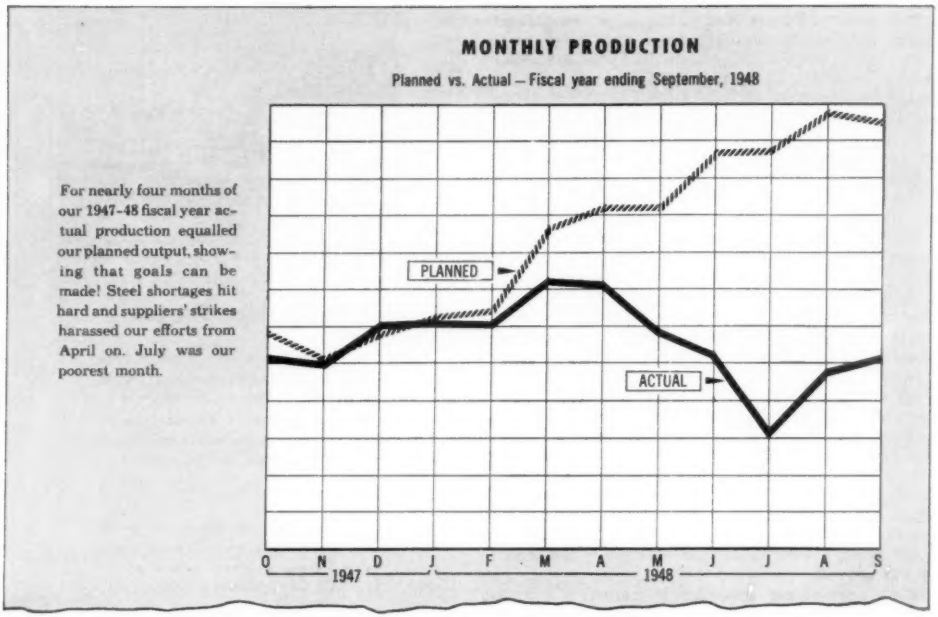
President and General Manager


INFLATION
INCREASED PRODUCTIVITY
Definition, Please
Somehow or other many people have the idea that, when someone suggests that increased productivity is the best answer to inflation, he means that a company should get more work out of its employees without paying more money in wages.
That's not it at all.
Increasing productivity means turning out a product at a lower cost. It means finding new and better methods of doing a job. . . . It means using new and more efficient machinery. It means finding and eliminating waste.
It doesn't mean "slave driving."
Increasing productivity isn't easy. It takes cooperation, effort and thought . . . a good deal of thought. But we've said before, and we'll say again and again, that there's only one sure way of licking inflation . . .
. . . and that's through increased productivity.
INDUSTRIES of The NAUGATUCK VALLEY

11 · INDUSTRIES OF THE NAUGATUCK VALLEY (CONN.)

This association is sponsoring a series of advertisements in Naugatuck Valley newspapers. One is reproduced above. All bear on the theme of lower costs . . . to fight inflation, to prevent unemployment, to bring lower prices, to preserve free enterprise, and so forth. The highly industrial nature of the valley means that a very high proportion of the newspaper readers reached are industrial employees or relatives of industrial employees, so community coverage is particularly effective.

(Continued on next page)


MONTHLY PRODUCTION
Planned vs. Actual – Fiscal year ending September, 1948
For nearly four months of our 1947-48 fiscal year actual production equalled our planned output, showing that goals can be made! Steel shortages hit hard and suppliers' strikes harassed our efforts from April on. July was our poorest month.
PLANNED
ACTUAL
O N D J F M A M J J A S
1947
1948

12 · WILLYS-OVERLAND MOTORS, INC.—TOLEDO

Prime reliance for telling employees why costs must be cut is placed on supervisors. But Willys stimulates employees' interest in the subject by frequent articles and reports in its employee publication, "Unity." Example: The "planned *vs.* actual sales" curve reproduced here. That foremen might be in a position to answer questions resulting from such a presentation, a conference was held last December 6, at which time all supervisors were given complete charts and analyses of personnel on payroll; production and profit; profit per sales dollar, for Willys and all principal competitors; net profit per car; value of plant facilities and equipment; monthly sheet steel quotas and sources of steel forging bars; 1949 goals for capital expenditures, production, profit per car, and personnel on payroll; price competition; Willys' share of the market. In all cases, past record was contrasted with present performance and projected performance.

13 · THE YALE & TOWNE MANUFACTURING COMPANY—STAMFORD, CONN.

Periodic management meetings, daily contact between foremen and employees, and regular use of the employee publication to tell employees why costs must be cut are supplemented by special messages on the twice-weekly newscasts sponsored by Yale & Towne over the local radio station.

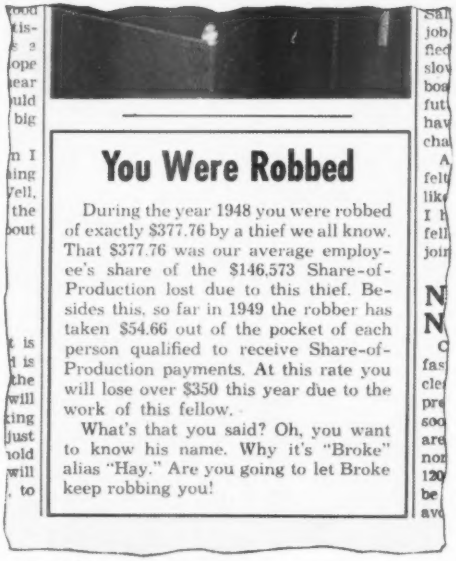
On April 19, April 30, and May 10, for example, the following message was read in the regular "commercial" spot: "The news that has disturbed America for many weeks is about industrial layoffs. . . .

"In a recent message to the men and women of Yale & Towne, Mr. Williams, general manager, said:

"'We must all do our part to halt the layoff trend by specific action. At the Stamford Division of Yale & Towne, we are doing our utmost to restore those conditions which will enable us to reestablish full employment. To achieve this goal, we must first recognize the relationship between layoffs and the unit cost of production. When we understand this relationship, we can see that our cost of production must be kept low enough so that we can compete successfully for business and thereby justify greater total output in our plant. Above all, we cannot—we dare not—add a single additional cost item.

14 · VIRGINIA ART GOODS STUDIOS—LYNCHBURG, VA.

With only 110 employees, this profit-sharing company finds it possible to take cost reduction problems directly to all employees at informal meetings. Example: At a recent meeting, employees were shown a circular advertising a directly competing product at $2 lower retail price. The company gives the general technique much of the credit for a recent 25 per cent increase in productivity.



You Were Robbed

During the year 1948 you were robbed of exactly $377.76 by a thief we all know. That $377.76 was our average employee's share of the $146,573 Share-of-Production lost due to this thief. Besides this, so far in 1949 the robber has taken $54.66 out of the pocket of each person qualified to receive Share-of-Production payments. At this rate you will lose over $350 this year due to the work of this fellow.

What's that you said? Oh, you want to know his name. Why it's "Broke" alias "Hay." Are you going to let Broke keep robbing you!

"Broke" and "hay," as used above, are paper mill terms for scrap—the Editors

15 · CONTINENTAL PAPER COMPANY—RIDGEFIELD PARK, N. J.

The share-of-production plan in effect at this company (FACTORY, November, 1948) gives management an excellent opportunity to point out, at regular weekly meetings with hourly employees, both general and specific ways and means of lowering production costs. The *why* of lower costs is always expressed in two ways: *improved competitive position and larger share-of-production payments for individuals.*

Constant cost-cutting reminders appear in the monthly employee publication. Examples: Under the head, "Leonard Williams Prevents a Shutdown," the paper told how the employee's quick thinking prevented a costly breakdown. Another article headed "Expensive When Wet" told how failure to notice a leak caused $1700 damage to a stator, with a $519 loss to share-of-production fund.

16 · THE SWARTWOUT COMPANY—CLEVELAND

President D. K. Swartwout sends letters to all employees about every three weeks. In addition to a review of the sales and profit picture, the letters often contain a report of a particular order soon to enter the shop, together with a friendly challenge to employees to better the estimated profit on the order. A portion of such a letter, as well as a portion of the "follow-up" achievement report is reproduced here.

March 25, 1949

Dear Fellow Employee:

In February, we only shipped out $148,949. This low amount of shipments gave us a loss of $6755. That loss wiped out our January profits and left us $4790 in the hole for the first two months. There you can see the effect of shipments falling off.

We got started with one of our very good customers years ago, and our valves have given them such good service that they have used our equipment almost exclusively through the years.

Well, our price and design on a recent bid apparently "rang the bell," because we now have an order for valves, all alike. Now we've got the job of finishing the design and making the valves, and making a satisfactory profit on them.

Let's each and every one of us be on the watch for this order as it goes through the engineering department, pattern shop, purchasing, machine shop, assembly, and shipping, and give it all we've got. We'll put it up to the cost department to tell us how we came out the minute the job is finished.

May 4, 1949

Dear Fellow Employee:

Those valves I mentioned March 25 are finished. The score is in, and it's good.

The engineers estimated that the direct material and labor might come to as high as $80, although they felt we should be able to shave that down some. But they set the selling price to give us a little profit at $80 direct cost.

Then the gang went to work. The engineers finished their design in short order. The pattern shop hopped on the patterns and had them out in jig time. Purchasing did a fine job in getting castings quickly and cheaply. The shop pounced upon them when they came in, and in almost less time than it takes to say it, they were through the machine shop, put together in assembly, and being crated up in the shipping department. And when we got all thru, instead of $80 direct cost, the cost department has turned in to us a figure of $66.65. On top of that, we shipped them three weeks earlier than promised.

Share of the profits. Did you notice when you got your last pay that the little mimeographed slip we all received had a change of words? Instead of saying "Your share of the profits" it said "Your *cash* share of the profits." That is the amount that went into your pay as cash.

Sincerely,
Denton Swartwout

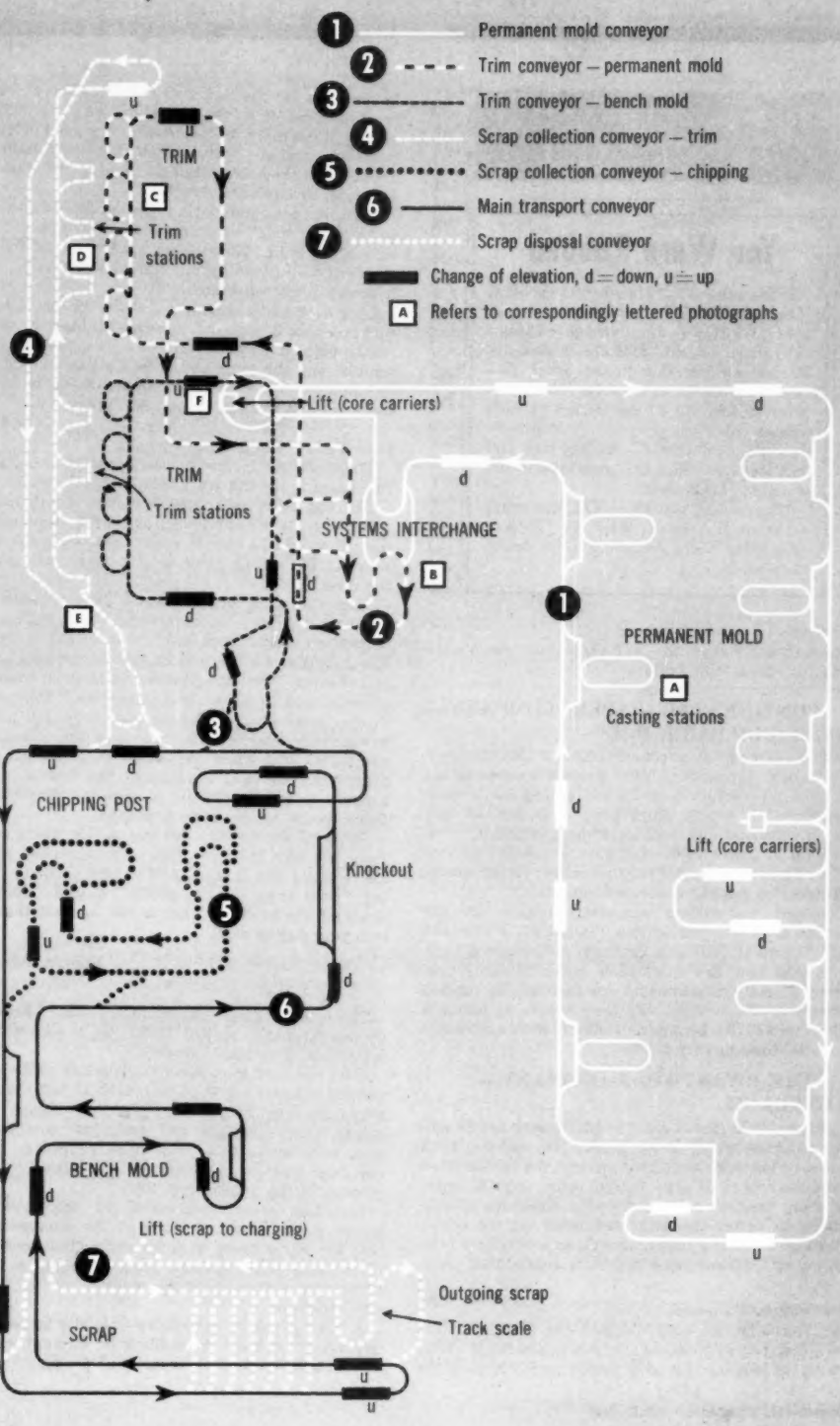
* * *

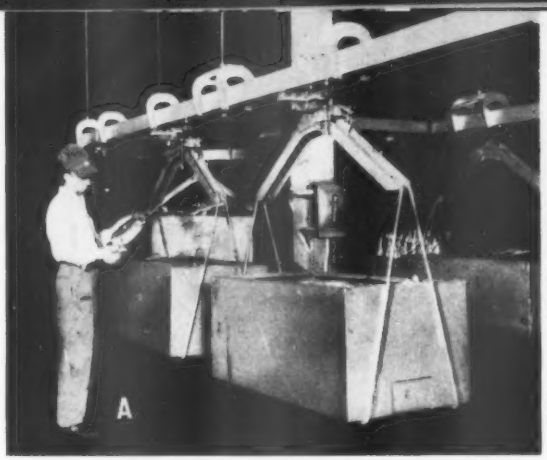
The preceding case examples are simply high spots of reports made to FACTORY by a representative sample of American industry.

Fifty per cent of companies reporting said they are relying entirely on word of mouth to tell employees why costs must be cut. They give foremen and supervisors fairly complete and up-to-date cost information, with instructions that it be related to specific cost improvement opportunities and passed on to employees at the appropriate time.

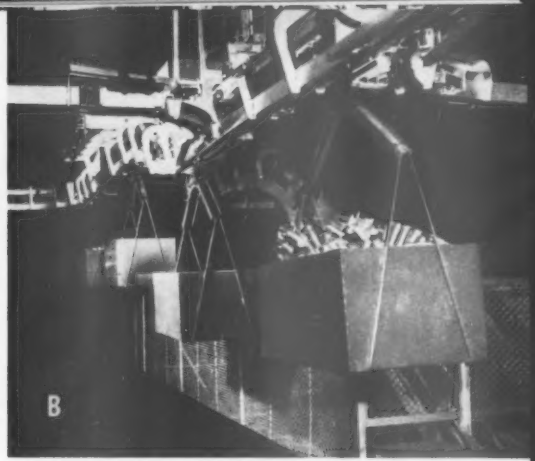
Including some overlapping of the above-mentioned group, about a third of the companies said that the job is being done by indirection—promotion of methods improvement, scrap elimination, and so forth, but without specific mention of the *why* of cost reduction.

A third group of companies—roughly 20 per cent—indicated that they are making no attempt whatever to tell employees why costs must be cut.


1 Permanent mold conveyor
2 Trim conveyor – permanent mold
3 Trim conveyor – bench mold
4 Scrap collection conveyor – trim
5 Scrap collection conveyor – chipping
6 Main transport conveyor
7 Scrap disposal conveyor
Change of elevation, d = down, u = up
A Refers to correspondingly lettered photographs
TRIM
C
Trim stations
D
4
F
Lift (core carriers)
TRIM
Trim stations
SYSTEMS INTERCHANGE
B
E
2
1
PERMANENT MOLD
A
Casting stations
3
CHIPPING POST
Knockout
Lift (core carriers)
5
6
BENCH MOLD
Lift (scrap to charging)
7
Outgoing scrap
Track scale
SCRAP



CASTING STATION is served by individual free loop to which operator can direct carriers as needed



INTERCHANGE area, of which only part is shown, permits transfer of carriers among all conveyors

Seven Power-and-Free Conveyors Mechanize Job Shop Foundry

C. H. DE LA MATER • WORKS MANAGER, BRIDGEPORT WORKS
ALUMINUM COMPANY OF AMERICA

SEVEN INTEGRATED power-and-free conveyors at Alcoa's Bridgeport plant are providing a degree of flexibility seldom if ever before achieved in a mechanized foundry. Production requirements for the Bridgeport operation are basically those of a jobbing foundry—mixed long and short runs, castings that range from a few ounces to several hundred pounds.

The question facing management when the decision was made to move to Bridgeport from nearby Fairfield was how to obtain the advantages of mechanized handling and still retain the jobbing character of the operation. The solution was found in over a mile and a half of power-and-free conveyors, comprising seven chain-driven power sections (5892 feet) plus 31 free loops and 20 free sidings (2819 feet).

The important feature of the system is this: All loops are independent units. Each can accept or reject any given carrier on the power section, or can shut down entirely, without affecting the operation of the system as a whole.

Without any costly or time-consuming adjustments—for that matter, without any adjustment at all—it is possible to vary the quantities of different types of work from day to day and even from hour to hour. Yet at all times there is complete segregation of the different types of castings, the different alloys of scrap, and the many classifications of cores.

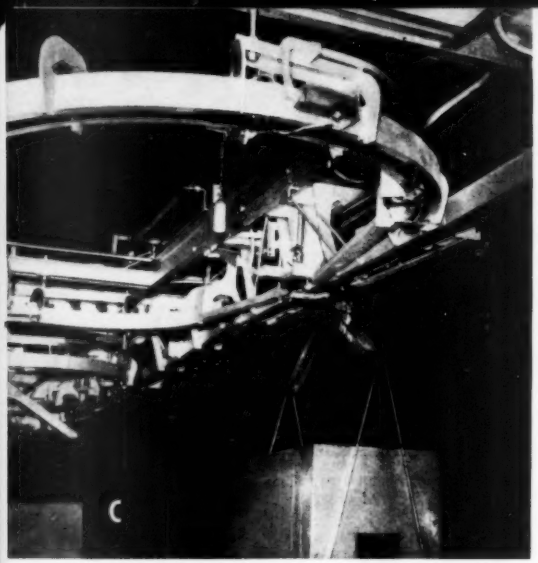
Operation of the system can best be described by following the progress of a single casting produced in the permanent mold department. Each of the loops shown in the diagram serves a casting station. Carriers are moved along the main conveyor by power-driven chain. By throwing a control switch into the open position, the operator establishes an electric circuit which will cause the next *empty* carrier on the main line to be switched to his loop.

Once on the loop track, the carrier travels by gravity past a limit switch to a pre-set mechanical stop on the track. When the next empty carrier approaches, it, too, is switched to the loop. However, its travel is stopped by the first carrier *before* it trips the limit switch. As a result, no further carriers will be switched to this loop until the operator releases the stop and lets the first carrier proceed to the working area. At that time, the second carrier moves up to the stop, tripping the limit switch in the process, and reestablishing the circuit that will permit another empty to enter the loop.

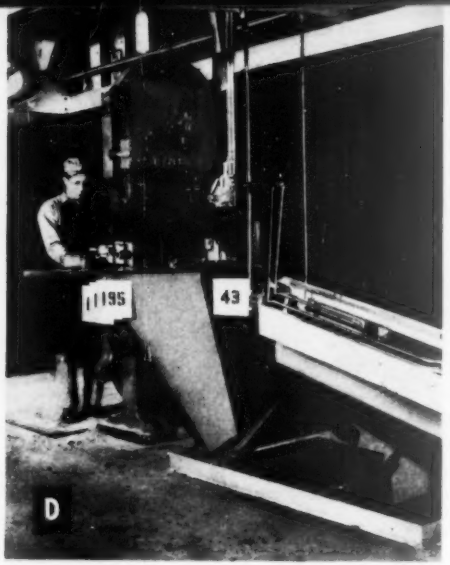
The effect of this arrangement is almost always to have at least one carrier waiting for the operator, and yet to prevent unwanted carriers from piling up at any operation. (If the volume of work being performed at a given station warrants, of course, it is possible to move the stop so that more than two carriers can enter the siding.)

When the operator has loaded the carrier with castings, it is returned to the main powered section of the conveyor through another system of interlocks. The carrier moves by gravity to a stop a few feet short

INTEGRATION of conveyors provides automatic travel between any two points in foundry. Free loops permit both type and rate of production to vary from zero to full capacity at each station, without affecting any other station, without need for adjustment. Carriers are accepted or rejected automatically



TRIM STATION has own free loop. Note switching arrangement for transfer to and from powered line



SCRAP COLLECTION at trim insures segregation of material by having empty carrier always waiting

of the main track, and there waits for the approach of the next empty dog on the chain (if there is a carrier on the approaching dog, the loop switch cannot operate). As the empty dog passes a relay, it closes a circuit which opens the switch from the loop onto the main track and also activates a pneumatic ram which pushes the carrier forward from the stop. Similar rams are installed at all switching points to insure that static friction does not prevent the carrier from rolling to the main track, where it is engaged by the dog.

As this full carrier proceeds along the main line, it is prevented by the action of a weight-operated microswitch from being switched onto other loops. It travels along the main track to the point where the permanent mold conveyor connects with the conveyor that goes to the trim room.

At this junction, the setting of the controls is reversed, and full carriers are transferred to the trim line. Any empties that were refused by all loops stay on the permanent mold track and repeat the trip around the department until accepted by one of the loops.

Switches on the trim line (which also connects with the foundry line, to accept full carriers from that department) are so set that once a full carrier is on the line, it cannot escape except to one of the loops at the trim stations. Trim operators watch carriers as they approach the station and throw the switch for their loop when they see a carrier containing the particular type of casting they are set up to handle. If the loop is full at the moment, the carrier can be permitted to pass and is picked up the next time around.

Empty carriers dispatched from the loops at the trim stations are automatically switched back to the foundry or permanent mold lines.

The trimmed castings are placed in tray carriers moved by a conventional overhead monorail trolley conveyor. This conveyor transports the castings to the next operation, and is not inter-connected with the power-and-free conveyors.

Transporting Scrap

A dump-bottom type of carrier is used for transporting scrap, but in most cases these carriers travel over the same lines as the others. There is one line, however, in the trim department, which accepts only empty scrap carriers. The loops on this line are markedly different from those in other departments.

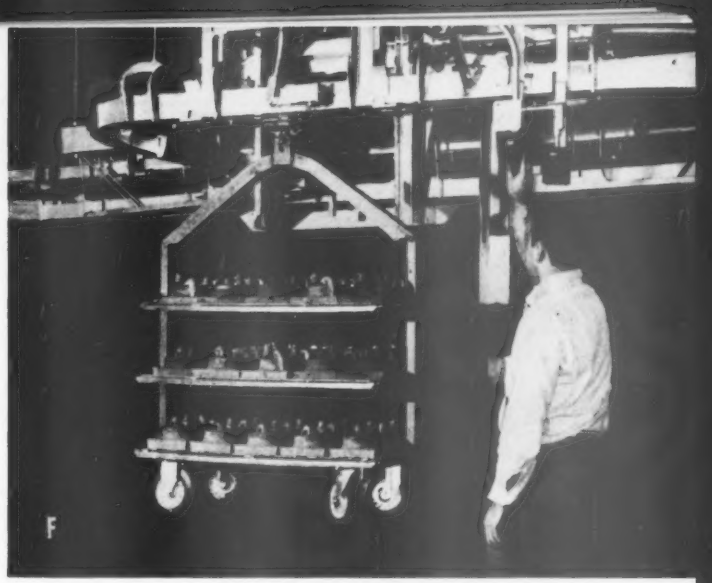
Each of the loops on the scrap line has a capacity of exactly two carriers: one in position to be loaded, the other in a waiting position. The carriers are switched off the main line in the regular way whenever the waiting position is open, and move perhaps ten feet along a spur which is perpendicular to the main line. At the end of this spur, the carrier comes to a dead stop, in the waiting position. From this position, there is a short, transverse, pneumatically operated elevator. When a carrier is required for loading, the operator throws a switch that actuates the elevator. This moves the carrier laterally and about one foot upward, into the loading position. (The waiting spur will now accept another empty.) The upward movement makes possible a gravity-feed of the loaded carrier back onto the main track.

It may be noted that the loop just described has the effect of turning the carrier around, as it comes off the main track. In order that electrical contacts need not be manually reversed, the trim track moves the full carriers to an automatic turntable as they enter the conveyor to the scrap collection area.

The contacts on the scrap carriers are set in such a manner that the scrap carriers automatically bypass all sidings and loops as they move to the scrap area. There they are shunted onto one of the transverse tracks and held until the scrap is needed.

At that time, carriers are moved from the gravity-feed shunt tracks to a powered loop, which carries them over a track scale and then either to a shipping platform (for outgoing scrap) or to a track siding (for furnace charging). Through an automatic switching arrangement, the man who now handles all scrap can determine the destination of individual carriers, based

TURNTABLE reverses carrier during its trip to the scrap disposal area



LIFT SECTION of free loop provides for placing core carriers on track, later removing them in permanent mold. Interlocks prevent bumping

on the type of alloy they contain.

When a carrier is wanted for charging, it is switched to the siding and then to a single spur, the end section of which is an elevator. By this means, the carrier can be lowered to a short roller conveyor and pushed forward, away from the track. A monorail hoist is then used to transport the carrier to the furnace and return it to the conveyor, where it is rolled back into the lift section of the track.

The switches on the loop in the scrap area are pre-set to divert empty carriers back onto the main track for the return trip to the trim department. And, for example, if it is necessary to move unwanted carriers (containing the wrong alloy) onto the loop in order to get at one which is wanted, the full carrier will make the trip around the loop and feed back onto one of the shunt tracks.

Transporting Cores

The third type of carrier used is of double- or triple-deck wheeled tray construction, for transporting cores. Because of the damage that would result if a loaded core-carrier was bumped by any other carrier, the contacts are so arranged that they can leave the powered track at only two points. One of these points is roughly in the center of the permanent mold department, the other in the center of the sand foundry. A single-track spur with a lift section (similar to the one in the scrap area) is used to deliver the carriers to the floor. The switches on the spur are so arranged that no more than one carrier can be on it at any one time. Should a loaded carrier reach the spur at a time when it is occupied, the conveyor would stop and remain stopped until the carrier was unloaded. This effectively prevents unnecessary travel of core carriers and reduces the possibility of core breakage.

Mechanical Details

Control of movement over the power-and-free system is provided by 335 limit switches, 116 two-way power operated tongue switches, and 31 manually operated stub switches. Power for the variable-speed drives on each of the conveyors is supplied by either 3-hp. or 5-hp. electric motors. The nature of the switch-overs between conveyors renders the speed of each independent of the speed of the others. Switches are operated by a 110-volt circuit, and the control circuit (which necessarily involves semi-exposed contacts) is 24 volts to minimize possible shock dangers to workers.

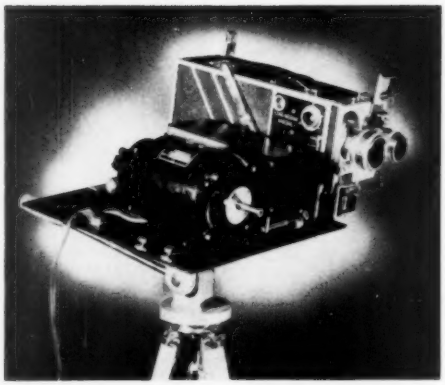
Handling capacity of the conveyor is considerably in excess of the present capacity of foundry facilities, so that any foreseeable expansion will not require changes in the conveyor.

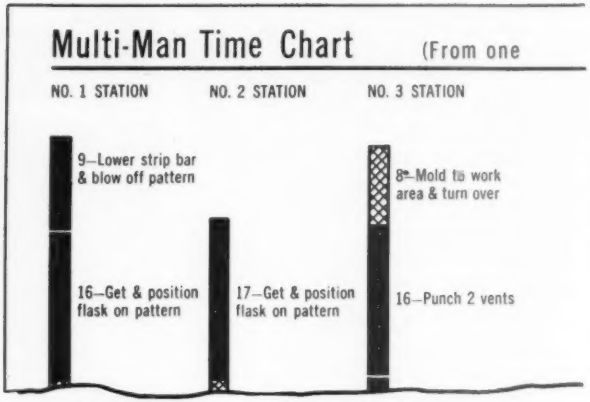
Because the conveyor was installed at the time of a move into a new foundry, it is not possible to express in dollars and cents just how much it may have saved. But by comparing the Bridgeport operations to those in the abandoned Fairfield plant (the same type of work), there is no doubt that the power-and-free conveyor has done these things:

1. Improved working conditions. The whole foundry is cleaner. There is less heavy lifting. There is more physical freedom for the worker, both real and psychological, because he is no longer penned in by skid boxes of castings, cores, and scrap. And accident hazards have been greatly reduced.

2. Improved production schedules. Delays in waiting for work or handlers have been totally eliminated. By segregating material at its source and keeping it segregated, sorting time has been eliminated. Moving time has been reduced. Castings no longer get lost. Delivery dates can be quoted with greater certainty.

3. Improved flexibility of operation. The jobbing character of the foundry has been retained in the process of mechanizing the handling setup. Because almost every individual operation has been made more efficient, it is possible to produce a greater diversity of products in more widely varying quantities than ever before — and at lower production cost.




Multi-Man Time Chart (From one
NO. 1 STATION
NO. 2 STATION
NO. 3 STATION
9—Lower strip bar & blow off pattern
8—Mold to work area & turn over
16—Get & position flask on pattern
17—Get & position flask on pattern
16—Punch 2 vents

MOTION STUDY application of memomotion technique is shown in the case of multi-man time chart for nine-man foundry crew. Camera equipped with special gear drive was used to

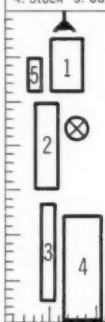
Memomotion Study Technique Simplifies Work Analysis

Time Study Sheet

Operation *Cut-off* Part *Pressure chamber shell* Machine type and no. *#2 Modern*

Time began study *4:30 P.M.* Time ended study *4:35 P.M.*

WORKPLACE SYMBOLS
Camera ⊗ Operator
1. Finished piece box
2. Machine 3. Rack
4. Stock 5. Odd piece bin

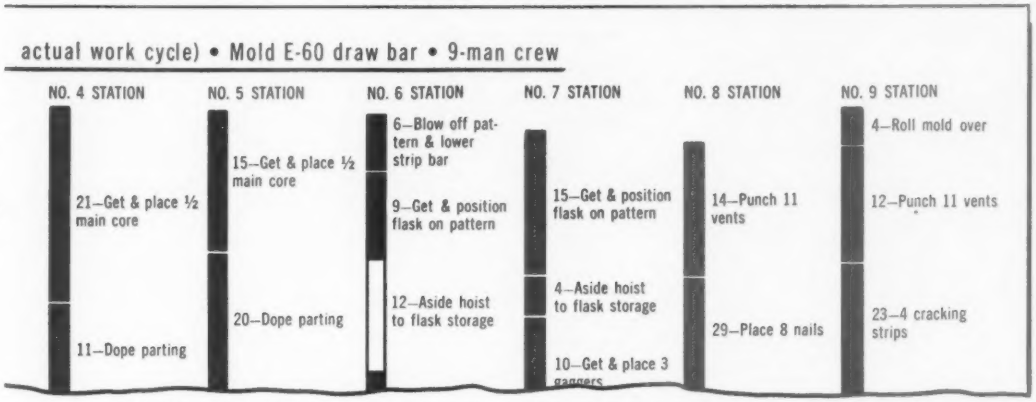


Production at standard Cuts per hour *330*

Production during study Cuts per hour *448*

	Elem. No.	LEFT HAND DESCRIPTION	RIGHT HAND DESCRIPTION	No. of Obs.	Allowed Time
A	(1)	To stock, load one piece in machine and load three pieces on rack behind machine, to feed lever on machine		1	015
B-1	(2)	G feed lever, TL lever ½ down, H, TL lever down, H, TL lever back vertical, RL feed lever	TE to end piece pipe, G, H piece, TL piece to odd piece bin, RL piece, UD	3	014
B-2	(3)	TE to cut-off handle, G handle, U handle to cut-off piece	TE to new pipe, G pipe, H pipe during cut-off	3	006
C-1	(4)	TL cut-off handle down, H handle	TL to finished box, RL piece	23	024
C-2	(5)	H handle, TE to feed lever, G lever, start TL feed lever down	TE to burr handle, G, U to burr end next piece, RL burr handle	23	036
C-3	(6)	Finish TL feed lever down, feed begins, H lever, TL lever back vertical, RL feed lever	TE to cut-off handle, UD at handle	22	039
C-4	(7)	TE to cut off handle, G handle, U handle to cut-off piece	UD at handle, TE to pipe, H pipe	22	033
D-1	(8)	TL cut-off handle down, H handle	TL to finished box, RL piece	3	.002
D-2	(9)	H cut-off handle, UD while wait for RH	TE to burr handle, G handle, U to burr end next piece, RL burr handle	3	003
E	(10)	To machine, load one piece in machine, to feed lever on machine		2	.010
		Sequence A-B-6C-D-E-B-6C-D-E-B-6C-D-E-B-6C-D			
			Minutes TOTAL TIME ALLOWED PER PIECE		.182

TIME STUDY application of memomotion technique is shown in the case of tube cutoff operation. Standard was set by analysis of five-minute film. Film was shot in five minutes, cost 55 cents


actual work cycle) • Mold E-60 draw bar • 9-man crew
NO. 4 STATION
NO. 5 STATION
NO. 6 STATION
NO. 7 STATION
NO. 8 STATION
NO. 9 STATION
21—Get & place ½ main core
11—Dope parting
15—Get & place ½ main core
20—Dope parting
6—Blow off pattern & lower strip bar
9—Get & position flask on pattern
12—Aside hoist to flask storage
15—Get & position flask on pattern
4—Aside hoist to flask storage
10—Get & place 3
14—Punch 11 vents
29—Place 8 nails
4—Roll mold over
12—Punch 11 vents
23—4 cracking strips

make film record of one complete work cycle at film rate of one frame per second. The time chart, of which a portion is shown above, was developed wholly from film analysis. Savings here were 19 per cent

M. E. MUNDEL • PROFESSOR OF INDUSTRIAL ENGINEERING
PURDUE UNIVERSITY, LAFAYETTE, IND.

COST AND COMPLEXITY of analysis have been stumbling blocks to the widespread use of motion pictures for everyday time study and work method analysis. Memomotion study has been developed to overcome these handicaps.

Memomotion pictures differ from those usually encountered in that they are taken at the rate of one per second instead of the usual 16 per second. The exposure of 1/12 second is less than half the standard exposure to simplify illumination of the work place.

The one-per-second feature offers a substantial advantage in economy. With film at $6.60 for 100 feet, pictures taken at the rate of 16 per second cost about $1.65 a minute, while a one-minute memomotion record costs 11 cents.

Another advantage of the slower rate is that the cost of analysis is reduced, in time and effort.

There are also several advantages more or less common to all methods of motion picture analysis which memomotion study makes more readily available:

1. It permits greater accuracy than stop-watch studies when used for time study purposes.
2. It permits observation in greater detail than floor studies.
3. It provides greater flexibility. The record may be reviewed and analyzed when most convenient.
4. The record is positive. Questions concerning details of the method, work pattern, crew distribution, or time values may be settled directly without having to depend on secondary sources.

Areas of Usefulness

Memomotion study is designed for:

1. Motion study of:
   a. Long cycles.
   b. Irregular cycles.
   c. Crew activities.
   d. Work or material flow over large areas.
2. Time study of:
   a. Any job normally studied by stop-watch methods.
   b. Lengthy or complex cycles.
   c. Crew jobs.

Equipment Required

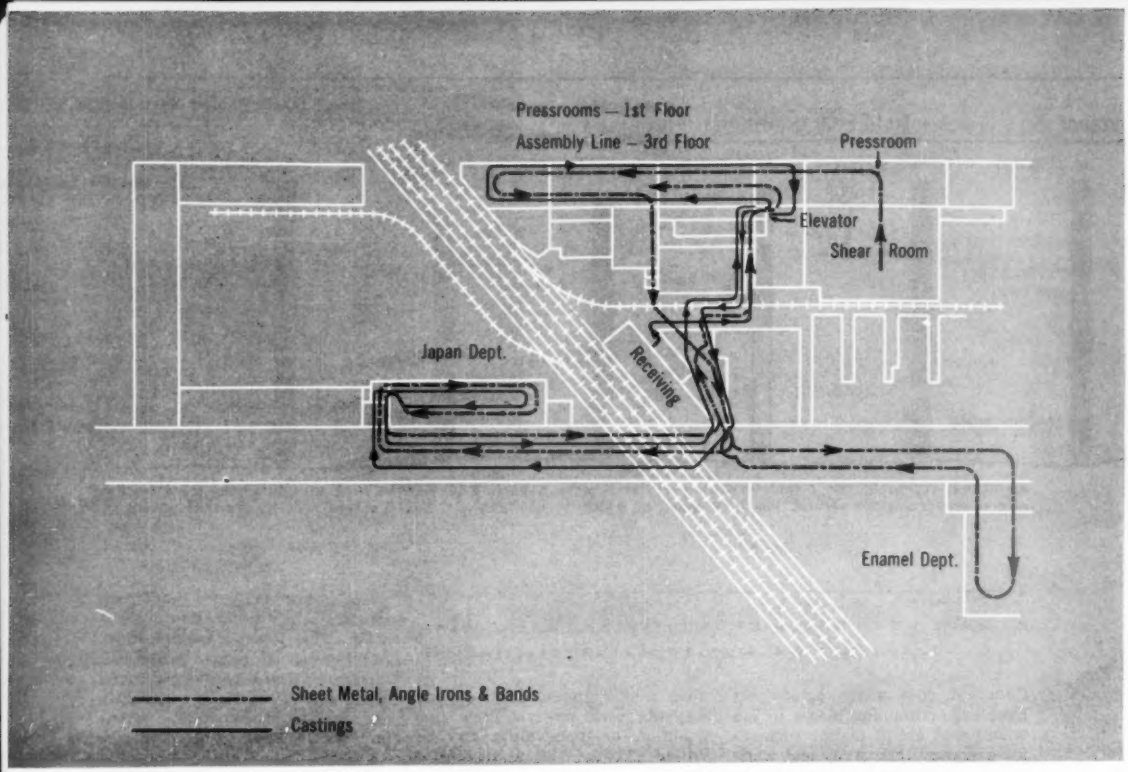
To permit picture taking at the frame-per-second rate, a special synchronous motor drive is attached to the camera. One version of the drive has three gear trains, a gear shift, and a universal coupling. In addition to memomotion pictures, this drive permits the taking of 10-per-second and 1000-per-minute pictures.

Any projector may be used for film analysis. Better results are obtained, however, when the projector is equipped for memomotion analysis. Such a projector automatically advances the film one frame each time a control button is pressed. To permit viewing in sequence, the projector will run steadily when the button is held down. This is a valuable feature. Acceleration of one-per-second pictures to sixteen times normal speed often emphasizes the undesirability of motion patterns that have passed unnoticed.

Memomotion Case Examples

Case 1—Motion Study. A multiman analysis of a nine-man foundry crew was made from a memomotion film. Before taking the pictures, members of the crew were fully informed of the purpose of the analysis. The only supplementary lighting used involved replacing the bulbs in the normal overhead lights with No. 2 photoflood bulbs. Use of the films permitted thorough evaluation of the existing cycle, the synthesis of proposed cycles, and an estimate of potential savings.

Case 2—Time Study. Analysis of memomotion film of a tube cutoff operation provided data for method description and time values. A short section of additional film taken at 1000 frames per minute permitted restudy of the pace for leveling purposes. Leveling could also have been done by the time study observer while the camera was operating at memomotion speed. Under such conditions his undivided attention could have been given to operator performance. In this case the film record was made at high speed so that the rating could be reviewed by other time study men, the time study supervisor, and the plant grievance committee, if this was necessary.



BEFORE **Nine buildings with a total usable floor space of 400,000 square feet were physically split by main-line railroad. That, plus multi-story construction, made materials handling awkward**

New Plant Expands Capacity

Other advantages include less work-in-process, reduced maintenance cost, lower per unit power consumption, fewer guards, more flexibility for re-layouts

A. W. LEESEBERG • PLANT MANAGER, AMERICAN STOVE COMPANY, CLEVELAND

HANDLING PROBLEMS resulting from the use of nine buildings for what we knew should be an integrated production operation posed a real threat to the competitive position of the American Stove Company.

The buildings were old. Structural limitations prevented the use of modern, mechanical handling methods. Column spacing made efficient layout impossible. And the railroad tracks that divided the buildings into two groups were the final barrier to the improvements in our operations that would be required to meet our expanded production schedules.

A production-balcony plant comprising some 250,000 square feet of production space capable of conversion to our operations provided the answer. It has replaced the nine buildings with their 400,000 square feet. The unit cost reduction in plant overhead alone might have made the move worth while, but since moving into the new plant we have found ten added advantages:

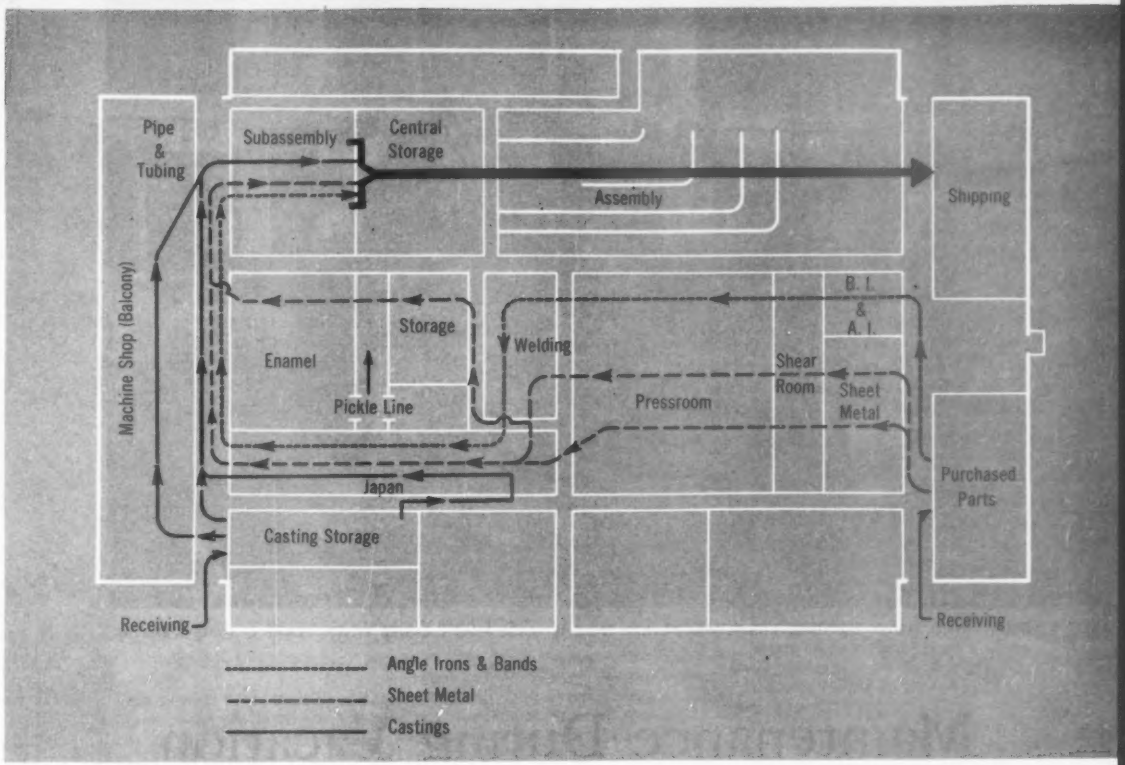
1. Primarily through improvement in materials handling, overall labor costs have been materially reduced.

2. Work-in-process inventory has been cut 50 per cent.

3. Individual motor drives rather than line-shaft drives have been a major factor in bringing about a reduction of 42 per cent in power consumed per dollar of output.

4. Electrical maintenance costs have been reduced 25 per cent.

5. Bus ducts provide extreme flexibility for moving machinery, compared with the conduit-and-box setup at the old plant.



AFTER **One building with production balcony (shown at left) can handle expanded capacity in only 250,000 square feet. Flow line shortened, elevators eliminated, efficiency greatly increased**

in One-Third Less Floor Space

6. The smaller number of exits at the new plant has made it possible to cut the watchman force from 18 to 4 men.

7. Wider column spacing permits a more efficient layout which requires only one-sixth as much aisle space as in the old plant.

8. We now have seven lift trucks in operation, where load limits on multiple stories did not permit us to use any before.

9. Seventeen elevators have been eliminated, each requiring not only the services of an operator but considerable maintenance.

10. The new, conveniently located, sanitary locker room provides spacious and well-lighted facilities, and is easier to keep clean and service than the old ones.

If you keep in mind the mechanized handling possible with the new installation, the accompanying flow diagrams tell the story. The distance which castings move in the production cycle (solid line) has been reduced from 1400 to 348 feet. Formerly, castings had to be moved from receiving to the second floor, by elevator, then returned to receiving to be loaded on a trailer truck. The truck took them across the tracks to the japan department, and later brought them back for another elevator trip, this time to the third floor for assembly. Now the flow is on the straight-line principle; the only vertical movement is a short lift to the balcony for castings to be machined.

Sheet metal (dash line) and angle irons and banding irons (dotted line) now travel only 720 to 835 feet, over optional routes, instead of the 1140 feet they formerly traveled over an inflexible route. And just as in the case of the castings, the truck trips to japanning have been eliminated.

All parts now feed in a regulated manner to the subassembly department, which is so set up that subassemblies are delivered from the lines right to final assembly. To provide flexibility for production of slow-moving items, a central storage area is located between subassembly and final assembly.

Four parallel assembly lines produce all models. The ranges progress along roller conveyors through the various operations, until they emerge completed and ready for shipment. From the lines, finished units are moved by lift truck to the shipping department, where truckloads are assembled and dispatched.

RELOCATING HEAVY EQUIPMENT IS A MAJOR JOB THAT IS MADE MUCH EASIER WHEN PLANT IS NOT OPERATING

Maintenance During Vacation Costs 60 Per Cent Less

A shutdown for vacations enables maintenance department to do a better job on many kinds of work at a saving—in this instance, 60 per cent

W. F. BOWER • PLANT ENGINEER, SKF INDUSTRIES, INC., PHILADELPHIA

MAINTENANCE WORK done during the summer shutdown costs less than 40 per cent of normal. Also, a better job can be done. At least that is SKF experience.

For several years these plants have been idle for one week during the summer. The purpose, of course, is to give the employees a vacation, and to prepare all equipment for another year of operation. With most personnel out of plants and offices, except for skeleton forces, the twin problems of meeting vacations and of carrying out needed maintenance projects with a minimum of interference with production schedules were solved in an orderly manner.

Because a majority of employees are now entitled to two or more weeks of vacation, the plants were closed for a two-week period in the summer of 1948. This decision was reached early in the year and notices posted to this effect, so that employees might have ample time to plan for vacations.

Summer shutdowns are not peculiar to our company. Others have adopted this practice in recent years. To those debating the desirability of such a move, it may be of interest to detail briefly the value of summer shutdowns to us, from a plant maintenance standpoint. We have been building up such experience for several years.

Any plant engineer thinks of major plant changeovers in terms of from about midnight Friday to 7 a.m. Monday. To be sure, the plant is ready for operation on Monday morning, but the last four hours before the whistle blows on Monday morning often are nerve-wracking.

Last year we had six months in which to plan how we could best utilize the two-week shutdown. This amount of time gave us an opportunity to itemize each job, prepare drawings, estimate material and labor costs, obtain approval of expenditure authorizations, and order and expedite materials.

The SKF maintenance department is divided into five groups. These groups are supervised by the following foremen: (1) millwright, who is responsible for all mechani-

cal maintenance and construction; (2) electrical; (3) lubrication; (4) carpenter, who also supervises the painters; (5) housekeeping, who is charged with the upkeep of buildings and grounds. These foremen report to the assistant plant engineer, who supervises and is responsible for plant layout and materials handling, and to the plant engineer.

Preliminary groundwork for shutdown jobs is laid in a series of meetings attended by this group. Each group foreman lists jobs he feels are both desirable and necessary at this particular time. These are discussed and a tentative list of jobs compiled. At the same time, the various general foremen of the manufacturing division are consulted and asked to list projects needed in their departments. The lists are integrated and again subjected to thorough discussion with the maintenance foremen. Certain projects are withdrawn if the schedule appears to be too crowded, and rough estimates of labor and time required for the remainder are drawn up.

This general list is then discussed in detail with the factory superintendents and with other supervision, as circumstances dictate. Once approved, the job list is turned over to plant layout for the preparation of estimates and the initiation of expenditure authorizations. As approvals are received, materials are ordered, and expedited, if necessary.

Two months now remain before the scheduled shutdown. Practically, the schedule of projects is in shape except for minor changes, which inevitably occur. Some projects may be dropped temporarily by top management, and others may have to be postponed because of production changes.

About a month prior to the shutdown all maintenance personnel scheduled to work during the two-week period are notified and, as far as practicable, men are scheduled who have expressed a desire to work during this period. Of 100 members in the maintenance department, 65 were on shutdown duty last summer.

Even with matters well in hand there is no "coasting" in the month preceding the shutdown. Last-minute rush jobs always require schedule revisions. A few men ask to have vacations shifted from the shutdown period. Some materials must be expedited. Nor is it uncommon, for example, to find that substitutes must be made for some items in short supply. Generally speaking, however, the arrival of the shutdown period finds us in good shape and ready to begin a job we have been anticipating.

Thus, we have fourteen days of planned work (ten days at straight time) uninterrupted by telephone calls, breakdowns, salesmen, or any of the many minor mechanical ills to which maintenance departments are heir.

Such projects as floor and driveway repairs normally are performed here by outside contractors, on a straight time basis. Ample time is allowed for setting up before trucking is permitted, a factor that lowers costs and leads to better end results.

A partial list of jobs performed during the 1948 shutdown follows. Although incomplete, it is representative of all the work and gives a well-rounded picture of the larger jobs that were undertaken. It is obvious why most of these jobs can be done faster, better, and more cheaply during the shutdown period. In fact, some of them could not have been done at any other time without serious loss of production. The jobs marked with an asterisk were let to outside contractors, but supervised by SKF foremen.

ELECTRICAL

*Installed time synchronizer on master clock.

*Replaced three-phase isolator on main 13,200-volt circuit breaker.

*Cleaned and repaired all time recorders.

*Installed new electronic precipitator units in air conditioning equipment filters.

Cleaned lights in six departments.

Cleaned and painted a large number of motors.

Installed or relocated machines in six production departments.

Replaced temporary wiring in seven departments.

Installed new bus duct in toolroom.

Cleaned and checked all d.c. generators.

Cleaned motors and checked bearings on air compressors.

Cleaned and checked all high- and low-tension electrical equipment, including dielectric check of transformer oil.

Made permanent repairs to power feeder damaged by fire, which had been temporarily repaired.

MILLWRIGHT

*Installed approximately 7000 square feet of new floor.

Cleaned and refilled two central grinding coolant systems.

Installed new bearings on one air compressor.

Relocated equipment in three departments.

Steam-cleaned all unit heaters.

Inspected all boilers, hot water generators, gas and air tanks, and aftercoolers.

Cleaned all exhaust fans and ducts.

Checked and repaired all lockers in women's locker rooms.

Relocated eight floor drains.

Inspected interior of chimneys.

HOUSEKEEPING

Cleaned and fumigated all locker rooms.

*Fumigated cafeterias.

*Cleaned all air ducts in air conditioned areas.

Cleaned exhaust hoods over cafeteria ranges.

Steam-cleaned all trash cans, floor platforms, and factory trucks.

Thoroughly housecleaned all factory and office areas.

CARPENTER

Repaired acoustical ceiling and asphalt tile floor in cafeterias.

Installed new locks on 125 lockers.

Repaired receiving department platform.

Repaired stake body on truck.

Painted all equipment in cafeteria kitchens.

Repainted all traffic lanes in driveways and parking lots.

Repainted all factory aisle traffic lanes.

Rustproofed interior of large degreaser.

Helped other groups with departmental moves.

Taking all factors into consideration, it is my opinion that the work was not only done better, but it was performed at a saving of 60 per cent or more over what it would have cost if the plant had been operating.

There was practically no overtime. All jobs scheduled were completed, and by far the majority of them were done in the time allotted. What overtime did occur came during the first week, serving as insurance on certain important projects. It was unnecessary to schedule workers on Saturday and Sunday of the second week.

Industrial Engineering—a Survey

New industrial engineering survey compares fifteen current plant practices with those reported by same companies in a similar survey made in 1945-1946

RALPH M. BARNES • PROFESSOR OF INDUSTRIAL ENGINEERING, COLLEGE OF ENGINEERING, UNIVERSITY OF IOWA

HERE IS A COMPARATIVE ANALYSIS of replies to a questionnaire on industrial engineering practices. It is presented as a guide to practices in the reader's own plant.

In March 1947, FACTORY published the first survey of this series. It reported practices in 80 companies in 1945-1946. This survey, made in the fall of 1948, includes replies from the same 80 plants and from nine additional companies.

Detailed breakdowns of the answers to 15 of the 39 questions contained in the questionnaire are presented in graphic form. For purposes of comparison, answers to both surveys are shown below. The lighter color bar designates 1945-1946 replies, solid color, 1948 replies.

No attempt was made to obtain data from a typical cross-section of industry. The original questionnaires were sent to companies participating in a work measurement project conducted by the author. A number of other companies, known to be interested in industrial engineering, were also included.

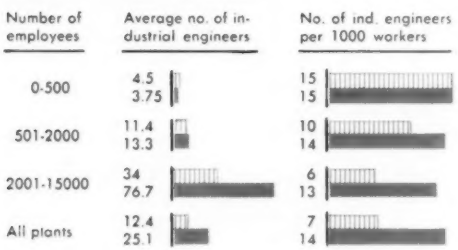
The 89 plants whose replies are analyzed here vary in size from 73 to 14,929 wage earners. The range in the first survey was slightly greater, 50 to 15,000 wage earners. Thirty of the respondents to the new survey have 500 or fewer factory employees; 20, 501 to 1000; 24, 1001 to 2500; 15, more than 2500.

In 50 per cent of the companies, the head of the industrial engineering department reports to the general manager or plant, works, or factory manager. In 20 per cent of the companies, he reports to the superintendent, in 12 per cent to the vice president of manufacturing, and in 18 per cent to other persons.

There has been a rise in the percentage of hourly workers on indirect labor from 26 per cent in 1945 to 32 per cent in 1948.

= 1945 - 46 = 1948

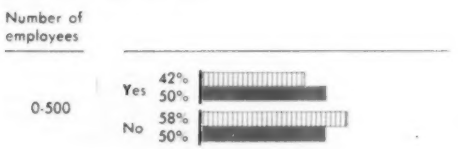
1 Total number of people in industrial engineering department:

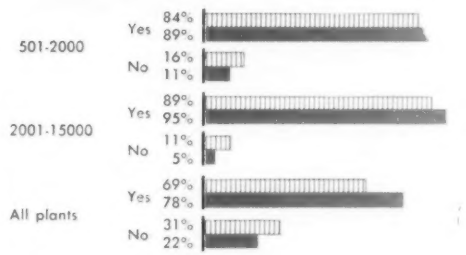


The average size of the 80 plants surveyed in 1945 was 1800 hourly employees and this "average plant" had 12.4 people in its industrial engineering department. In 1948 the average size of the 89 plants surveyed was 2021 and this "average plant" had 25.1 people in its industrial engineering department—an increase of over 100 per cent.

The number of industrial engineers per 1000 employees has increased from 7 in 1945 to 14 in 1948.

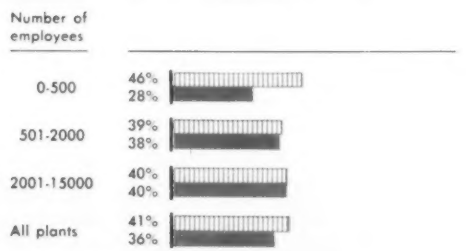
2 Do you use standard data in determining time standards?





The 1945 survey showed that 69 per cent of all plants use standard data in determining time standards, whereas the 1948 survey shows this percentage to be 78.

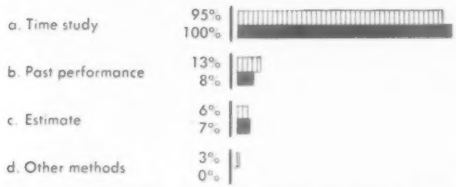
3 What percentage of piece rates (or time standards) are based on standard data?



# of Practice in 89 Plants

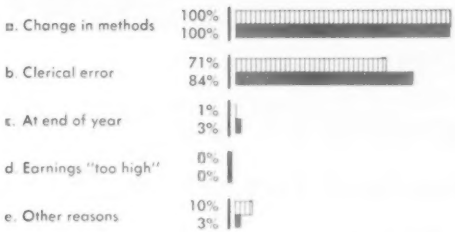
Forty-one per cent of the piece rates or time standards were based on standard data in the 80 plants surveyed in 1945, whereas 36 per cent of the piece rates are based on standard data in the 89 plants surveyed in 1948.

4 Percentage of companies using each of the following methods for setting time standards as a basis for wage incentive plan:



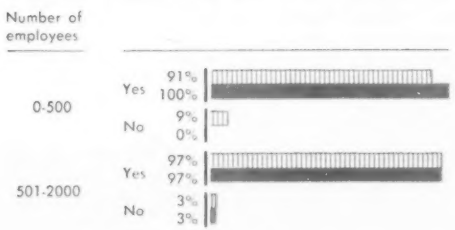
One hundred per cent of the companies using wage incentives use time study for setting time standards as a basis for their wage incentives now. Ninety-five per cent of the companies used time study when the survey was made in 1945.

5 Percentage of companies that change a time standard:



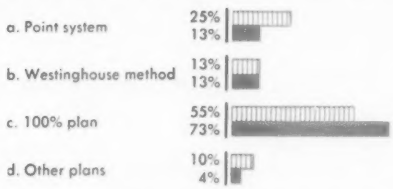
There is no significant difference between the replies received in the 1945 survey and those received in the 1948 survey.

6 Do you use any system of rating effort, speed, pace, or skill in determining time standards from stopwatch time study?



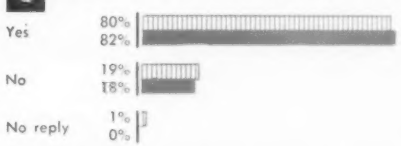
All but one of the companies reporting in the 1948 survey used some system of rating speed, pace, effort, or skill in determining time standards for stopwatch time study, whereas 94 per cent of the companies rated performance in 1945

7 Percentage of companies using each of the following systems of ratings:



There has been a decided increase in the use of the 100 per cent plan of rating time studies; whereas only 55 per cent used this plan in 1945, 73 per cent use it now. The use of the point system has decreased from 25 per cent in 1945 to 13 per cent in 1948.

8 Do you have a union in your plant?



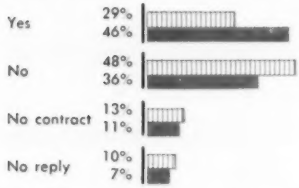
There is no significant difference between the replies received in the 1945 survey and those received in the 1948 survey.

9 Do you have union time study stewards in your plant?

There is no significant difference between the replies received in the 1945 survey and those received in the 1948 survey.

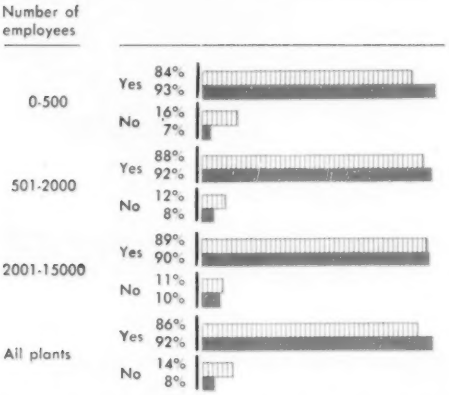
(Continued on next page)

10 Does your union contract contain sections pertaining to time study work?



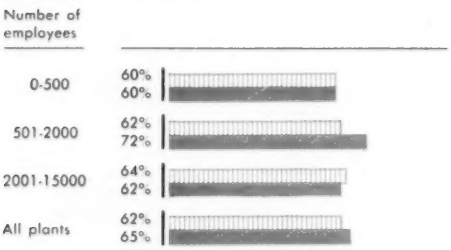
There has been a substantial increase in the number of companies that have union contracts containing sections pertaining to time study work. Only 29 per cent had such sections in their contract in 1945, whereas 46% now have such sections in their contract.

11 Do you pay some or all of your hourly factory employees on an incentive basis?



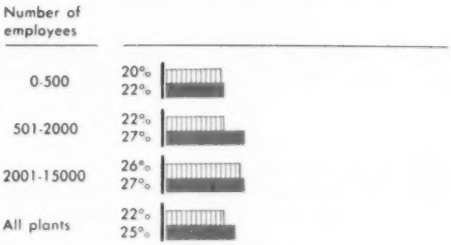
There has been a slight increase in the number of companies using wage incentive plans. In 1945 this was 86 per cent, whereas in 1948 it was 92 per cent.

12 What percentage of your direct factory labor is on incentive?



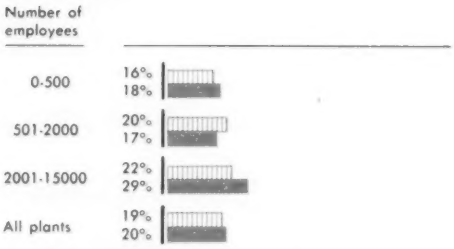
There is no significant difference between the replies received in the 1945 survey and those received in the 1948 survey, except for the medium-sized plants. The percentage of direct factory labor on incentive in 1945 was 62 per cent for this group of plants, whereas it is now 72 per cent.

13 Average earnings in per cent above base rate of hourly direct factory employees:



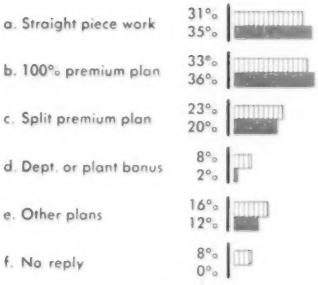
In those plants using wage incentives, the employees earned, on the average, 22 per cent above base rate or hourly rate in 1945. In 1948 this has been increased to 25 per cent.

14 Percentage of indirect factory labor on incentive:

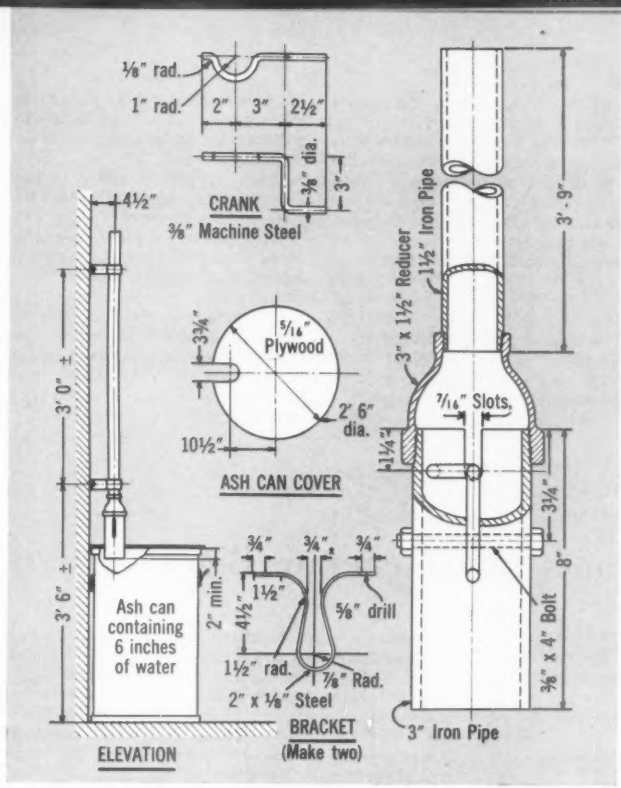


There is no significant difference between the replies received in the 1945 survey and those received in the 1948 survey.

15 Percentage of companies using each of the following wage incentive plans:



In comparing the results of the 1945 survey with the 1948 survey, there is a slight increase in the use of straight piece rate and the 100 per cent premium plan, and a slight decrease in the split premium plan and the department or plant bonus.



DESIGN FOR A LAMP SMASHER that is simple to make is shown above. Disposal of fluorescent tubes in this device is easy and safe

How to Dispose of Fluorescent Lamps Safely

W. E. ROSSNAGEL · SAFETY ENGINEER, CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., NEW YORK

As this article goes to press, announcement has been received that after June 30, 1949, three of the leading makers of fluorescent lamps will discontinue the use of phosphors containing beryllium.

The precautions described in this article will be necessary, however, for a considerable period, until all fluorescent lamps in service and in stock have been used up.—The Editors.

WHEN FLUORESCENT LAMPS burn out they are usually discarded, as are incandescent lamps, with other rubbish. Children have been known to pick up the lamps from disposal cans or dumps and to use them as ball bats, or make-believe clubs, until breakage renders them useless. When breakage does occur, a cut hand or finger frequently is the result. Consequently, the legal responsibility of those who discarded such lamps promises to be a matter of concern.

Few person realize the hazard of handling fluorescent lamps, or of improperly disposing of them. The tubes are coated inside with a white powder, which is commonly known as a phosphor and contains up to four per cent of beryllium. The tube is evacuated of air, and contains mercury vapor. Although poisonous if inhaled, the quantity of mercury is so small that relatively little hazard exists. On the other hand, the phosphor may be blown into a small dust cloud when the lamp is broken. This dust is highly toxic if inhaled. Also, when the lamp is broken either accidentally or during the destruction process, small fragments of glass may fly and strike persons, possibly causing minor lacerations of the skin. If the phosphor powder, even in minute quantity, gets into open sores, serious infections may follow.

Many physicians apparently are unaware, however, of the effects of even minor cuts or scratches caused by phosphor-coated glass.

Phosphor Powder Poisoning

At a recent national meeting of the American Association of Industrial Physicians and Surgeons, held at the Massachusetts General Hospital in Boston, the subject of poisoning from exposure to the phosphor powder was discussed at length. Their findings are said to indicate that if this powder comes into contact with any open lesions of the skin it begins to cause a tumor-like growth and degeneration. Pieces of glass that enter tissues have been known to cause long-standing, draining tumor masses, which may necessitate the removal of large areas of skin, muscle, and bone.

The National Safety Council advises: "Experience has shown that even a small amount of [fluorescent] powder remaining in a wound may delay healing and cause excessive growth in the scar."

In other words, it is extremely important to guard against inhaling this phosphor powder, getting it into a sore or cut, or receiving lacerations caused by the coated glass of a broken lamp.

Thus, the disposal of burned-out fluorescent lamps presents a serious safety (and legal) problem.

When large numbers of lamps are to be destroyed, as in factories and office buildings, a lamp smasher should be installed out of doors. It should be designed to confine the dust and broken glass, and to deposit them in water in the disposal receptacle. Gloves and goggles should be worn.

The sketch shows a suggested design for a lamp smasher that can readily be assembled. It consists of a length of 1½-in. standard weight iron pipe, a 3x1½-in. pipe reducer, a 3-in. pipe nipple, a crank, and

the necessary bolts and pipe straps. The device is mounted on a wall out of doors, with the lower end of the pipe projecting into the disposal can, which should contain five or six inches of water. A tight-fitting cover should be placed on the can.

The lamp to be destroyed is inserted in the upper end of the pipe, and the crank is turned until the last piece of the lamp has dropped into the water. When emptying the rubbish can it is advisable for the porter to stand with his back to the wind, so that if any dust escapes it will blow away from him.

Never dispose of fluorescent lamps in an incinerator.

While various organizations have proposed more elaborate rules for the disposal of fluorescent lamps, these rules have in many instances required the use of gas masks, tanks containing running water, and other precautions difficult to observe.

If new lamps are handled with extreme care, using gloves where possible, and if the burned-out lamps are removed and disposed of as described, the hazard of beryllium poisoning should be reduced to a minimum. Should a lamp be broken in the hands, or the skin cut, however slightly, by glass from a fluorescent lamp, it is vitally important that medical attention be obtained at once. The physician's attention should be called to the fact that the wound was caused by glass from a fluorescent lamp and that beryllium may have entered it. If the physician is not aware of the hazard, he should be told that special treatment must be given.

This article is not intended to cause unnecessary alarm, nor to restrict the use of fluorescent lamps, but merely to warn those who handle these lamps of the potential hazards and how to avoid them.

Good Power Plants Can Generate Big Savings

DAVID MOFFATT MYERS • MYERS, FULLER & ADDINGTON CONSULTING ENGINEERS, N. Y.

THE RAPIDITY WITH WHICH our industries have grown in size and production capacity over a relatively short period is an American phenomenon unequaled in any country in the world.

Going back only a brief 40 years, good coal was delivered at the plant for $2 to $2.50 a ton, common labor was $1.50 to $2 a day, and supplies were correspondingly cheap.

Small wonder, then, that plant owners expended but little thought and less money for improvement of steam and power facilities when the pressing urge was for more production. Capital funds were raised for increasing and improving the output of the factories. That is where the big money was to be made.

With cheap fuel and cheap labor the two principal items of power cost—which usually was a small fraction of production cost—it was perhaps only natural that the wheelbarrow served as the coal and ash conveyor; the shovel and men's muscles were the fuel firing and combustion system. Power generation was signalized by beautiful clouds of exhaust steam as a picturesque contrast to the black smoke from the chimney, to indicate that the plant was doing business and earning its dividends.

But those good old days are only a memory now. Today, the cost of coal at $10 a ton is four to five times the old figure, and common labor now costs seven to nine times as much for an hour of work. For each $25 formerly expended on fuel and labor, we must now spend $100 to $150 or more.

This means that where a 25 per cent improvement in steam and power supply in the past would have saved $20,000 a year, an equal improvement today would save $80,000 to $120,000, or four to six times as much. Yet there are numerous manufacturing plants, large as well as small, whose steam and power facilities were installed three to four decades ago when fuel and labor were dirt cheap. While their wasteful design and operation at that time represented a relatively small handicap to profits, the change to present-day costs and conditions places them in the category of big business, and very bad business.

As the cost of labor mounted through the years, it had the effect of causing the substitution of steam and power for more costly manual labor, thus increasing the proportion of heat and power cost in the total cost of production. It is estimated that machine power has been increased four and a half times since 1910.

The everyday efficiency now attainable with modern practice and design is also a great contrast to the best that was known 30 and 40 years ago.

Antiquated steam and power equipment still in use is doubly wasteful of dollars because of this greater demand coupled with, and contrasted against, much higher efficiency of the modern power plant.

As steam and power plants wear out and replacements become essential to continued production, there is always a choice of two policies. The cheaper policy is to appropriate as little money as possible to "get by" and keep production rolling.

The other policy is to determine by careful analysis the most economical program possible; then compare the costs and savings.

Long and intimate experience with such problems indicates that almost always the really engineered job, while requiring some more capital, returns that extra cost in from two to five years out of savings, and at the end of that period continues to add to the net earnings of the owners for many years to come.

The annual cost of power, heat, and light to manufacturing corporations may readily reach a figure equal to 60 to 100 per cent of paid-out dividends.

Skillful engineering and modernization of an obsolete steam and power supply often may reduce their cost by 10 to 30 per cent, which would be equal to an average betterment of dividends by 12 to 20 per cent. It also might reduce the manufacturing cost of the product so much in bad times as to spell the difference between red ink and black on the books.

Times are good now, and dividends can be made even with a "gay nineties" power plant. But the best time to repair the roof is when it isn't raining.

Electric Motor Controls

How to Select and Care for Them

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Efficiency of production operations often depends on how well motor controls meet requirements. That is why it is so necessary to select controls carefully, and give them the maintenance they need

Because a.c. is generally used throughout industry, this discussion will be confined to getting the most for your control dollar out of that type of equipment, whether to improve quality or increase output

The following 10 pages give details on selection and upkeep of controls

FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 120 • June, 1949
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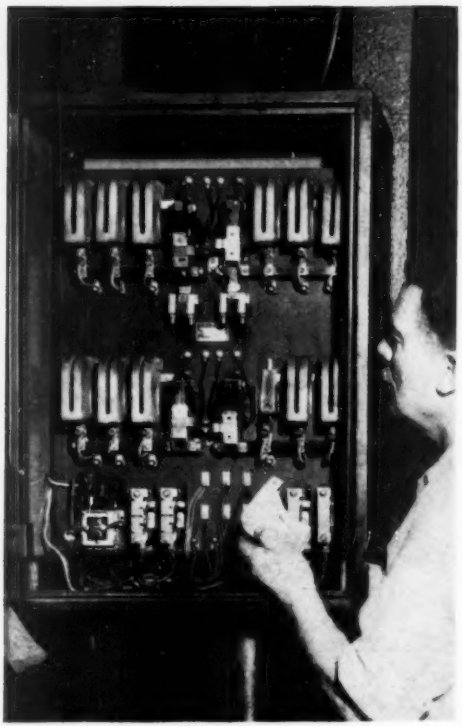
HOW TO SELECT ELECTRIC MOTOR CONTROLS



1 MAGNETIC CONTROLLERS use electromagnets to close the contacts, when their coils are energized

2 PUSHBUTTON STATIONS may be located away from control panels. This one is explosion-proof

MAGNETIC OR MANUAL?

One choice that has to be made is between magnetic and manual controls. A manual controller is one that is operated by hand, for example a drum switch, whose operation is initiated when an operator pushes or turns a handle. Manual controls are relatively inexpensive, small in size, and will give just as good service as magnetic controls. There is a definite limit, however, as to where they can be applied successfully.

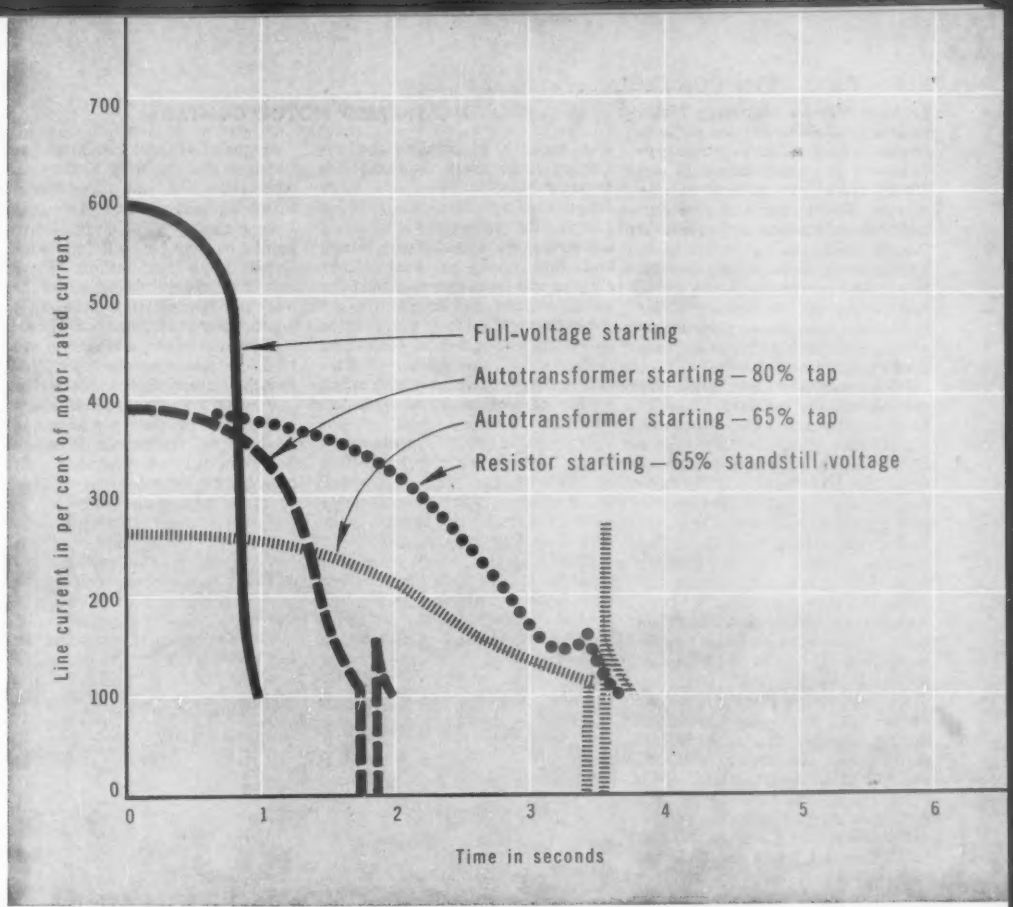
They are limited to low voltages (usually 600 volts) and relatively small currents. In general, they are suitable for motors that are to be started and stopped infrequently, such as those driving a lineshaft or ventilating fan. If the duty cycle is too strenuous, general maintenance and the renewal of worn parts may send the ultimate cost up to a point where their use is not economically justified. As a rule, if five to ten starts per hour are all that is required, manual controls usually will do the job.

A magnetic controller, Figure 1, performs its functions by electromagnets, and offers several definite advantages to offset its higher initial cost. A pushbutton station used with a magnetic control can be depressed many times a minute without tiring the operator.

Operating a manual control, especially for larger motors, requires some effort by the operator. If the motor is started and stopped frequently he may experience unnecessary fatigue, thus expending energy that could be more profitably utilized elsewhere.

A magnetic controller can be mounted wherever space is available and operated from a pushbutton that takes up very little space. Many features can be added to magnetic control to provide flexibility and precision of operation without increasing the space or energy required for it. These features permit operation from several control points, by changes in pressure, temperature, fluid level, travel motion, and so on.

Magnetic control also permits interlocking in order to start a number of motors in sequence; for example, when operating a series of conveyors.



3 **STARTING may be on full or reduced voltage. Curves show accelerating current of squirrel-cage motor driving loaded centrifugal pump, with full-voltage, autotransformer, and resistor starting**

FULL-VOLTAGE OR REDUCED-VOLTAGE STARTING?

Another choice to be made is between full-voltage and reduced-voltage starting. By far the largest number of motors above one horsepower used in industry today are polyphase, general-purpose, squirrel-cage induction motors. Several methods are used for starting these motors, depending upon the line capacity, motor characteristics, and the load.

The most economical and simplest method is to connect the motor directly to the power source, using a switch or contactor. Squirrel-cage motors usually are designed to permit full-voltage starting without damage to the windings. Full-voltage controls generally are applied to smaller sizes of motors, or used in applications where the high value of locked-rotor current at the moment of starting does not produce excessive voltage drop in the system.

Reduced-voltage starters are used where: line capacities are limited; voltage disturbances would produce excessive flicker of lights; excessive torque and heat produced by full-voltage starting currents might cause injury to motor or load, or to the mechanical connection between them.

The most widely used methods of reduced-voltage starting are by: (1) compensator or autotransformer type starter; (2) primary resistor starter and reactor starter; (3) increment starter.

Before a reduced-voltage starting method is selected, it must be recognized that any method that reduces the starting current to a motor also reduces the starting torque. Calculations must be made, therefore, to insure that the starting torque will be sufficient.

The torque of an induction motor varies as the square of the applied voltage at the motor terminals. There are boundary conditions in which the current that can be taken from the line will not produce enough output torque at the motor shaft. Hence, it is important to make sure that the proposed starter will meet all the requirements.

The autotransformer starter is suitable for use with two- and three-phase motors driving such equipment as pumps, conveyors, com-

pressors, and blowers. Motor torque available for the amperes drawn from the line with this type of starter is greater than with any other type of reduced-voltage starter. The torque and line current are reduced as the square of the voltage at the motor terminals. Taps provide for adjusting starting torque and current of the motor to suit load conditions. This flexibility is of great advantage, particularly where the starting-torque requirements are not well known.

Primary-resistor and reactor-type reduced-voltage starters usually have a lower initial cost than autotransformer starters. They take a higher value of starting current from the line than do autotransformer starters, which reduce the starting current almost in proportion to the transformer ratio. The starting current varies directly with the voltage at the motor terminals because the resistor or reactor is in series with each line to the motor and must carry the same current that flows in each motor terminal.

The resistor or reactor is put in series with the motor windings during starting and is short-circuited after the motor is up to nearly normal speed.

Increment starters, which are resistance starters in multiple steps, usually are used when starting limitations are based on a specific rate of current increase, to meet conditions imposed by the system.

Acceleration

If reduced-voltage starting is adopted, some method must be provided for cutting out the autotransformer, resistor, or reactor when the speed of the motor increases to a predetermined level. Several methods of current limiting, utilizing various devices, have been employed, but there is a quite definite standardization on the use of definite-time acceleration. Practically all present-day controls are furnished with this method of acceleration. It makes the motor do all it is capable of doing, and is well suited to loads that vary widely during the starting period.

More common types of timers are: motor-driven, mechanical escapement, magnetic, and electronic.

Selection should be made on the basis of speed and time of operation required, frequency of starting desired, and comparative costs of various ways of accomplishing what is needed.

MULTI-SPEED MOTOR CONTROL

The number of applications requiring multi-speed motors is increasing rapidly. More and more frequently, a.c. motors are being successfully applied where formerly d.c. motors were used. Two-, three-, and four-speed a.c. motors are simpler and less expensive than the variable-speed d.c. drives.

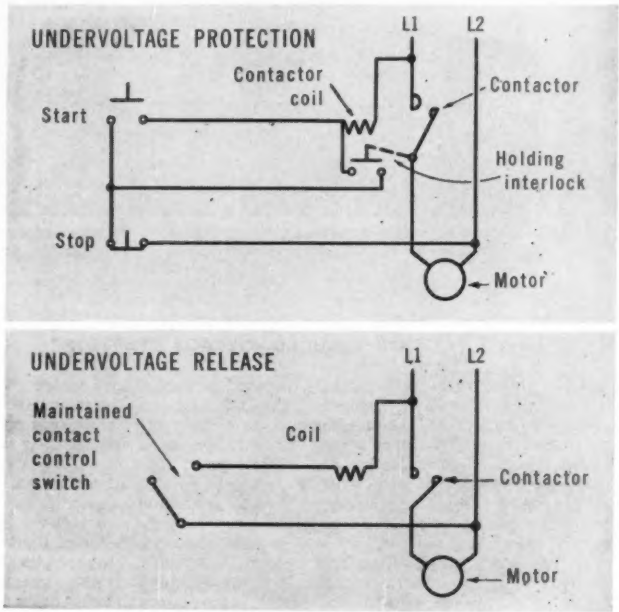
Multi-speed motors differ from standard squirrel-cage induction motors in that the number of poles can be changed by rearrangement of the current paths through the winding.

The type of control required may range from simple speed selection to timed shifting from one speed to another. Job requirements should be balanced against costs when deciding upon control.

Manual control, which is less expensive, is available up through NEMA size 5. Above size 1 a line contactor is required that will provide overload and undervoltage protection.

Magnetic control has many advantages that outweigh the low-cost advantages of manual control. Speed selection can be made from a remote point or number of points, or may be built in and initiated by a pushbutton. Wiring cost and space requirements are less, and less effort is required to depress a pushbutton than to operate a drum switch. Magnetic controls permit operation by limit switch or other pilot circuit devices.

If speed transfer requires special timing to prevent damage to product or equipment, magnetic controls can be provided with accelerating-sequence relays. These function to start the motor on the lowest speed, and after a time-delay transfer to the next, and so on until the desired speed is reached. They can also be provided with decelerating-sequence relays to disconnect the motor when running at a given speed and provide the required time for the motor to decelerate.



4 UNDERVOLTAGE PROTECTION keeps motor off the line after power failure. With undervoltage release, motor starts automatically

UNDERVOLTAGE PROTECTION AND RELEASE

Industrial controllers usually are furnished with protective devices for undervoltage protection or release to disconnect the motor from

the line upon failure of voltage. The difference between undervoltage protection and undervoltage release is not always clearly understood. The two have definite spheres of application, and the correct selection must be made to suit the individual job.

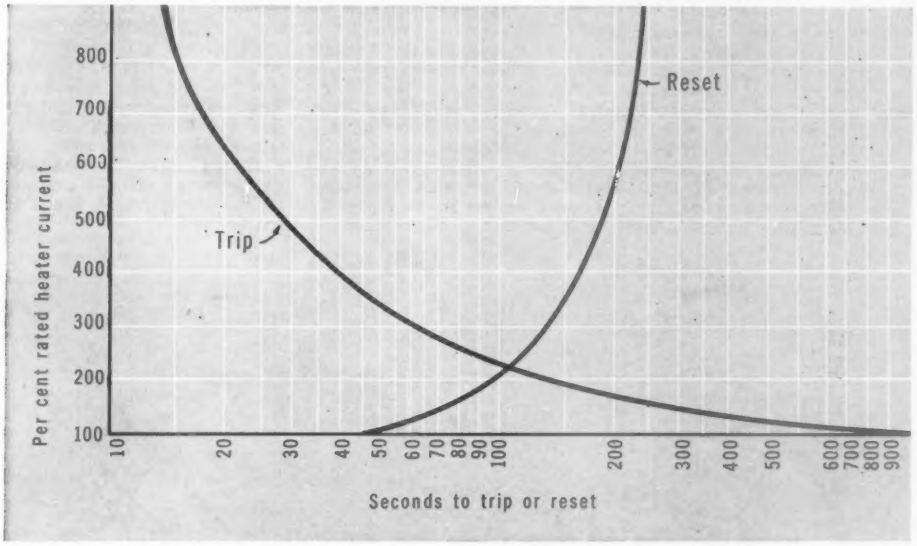
Functional Differences

Undervoltage protection (Figure 4) is defined as "the effect of a device, operative on the reduction or failure of voltage, to cause and maintain the interruption of power to the main circuit."

Undervoltage release (Figure 4) is defined as "the effect of a device, operative on the reduction or failure of voltage, to cause the interruption of power to the main circuit, but not to prevent the re-establishment of the main circuit on return of voltage."

Since undervoltage release permits the motor to react immediately upon return of power, it is suitable for applications where it is essential that the motor be restarted immediately and automatically after a voltage failure, as for example on fans or water pumps. Obviously, such equipment should restart automatically when voltage is restored. Magnetic controls provide undervoltage release if the pilot circuit control device is of the maintained type.

Undervoltage protection will not permit the motor to restart upon return of voltage until the operator has depressed the start button on the momentary-contact pushbutton station. This type of protection is a necessary precaution when the motor drives a machine which, if it restarted unexpectedly, might injure the attending operator. Also, in some plants, the restarting of all motors simultaneously might throw too heavy a load on the power line.



5 OVERLOAD RELAYS of the thermal type follow heating curve of motor, and thus permit it to operate at maximum safe temperature. If that temperature is exceeded motor is tripped off the line

OVERLOAD PROTECTION

Overload protection is inexpensive insurance for motor, control equipment, and branch circuit conductors against excessive heating due to motor overload. The control prevents the motor from overheating excessively, without shutting it down unnecessarily if the heat generated during that overload is not sufficient to damage the windings.

For some time it has been recognized that the overload relay gives the best all-around motor protection. The temperature overload relay in use today is a small device that opens the circuit to the operating coil of a magnetic contactor, or to the low-voltage coil of a circuit breaker. When used with magnetic contactors, arrangements can be made for re-establishing the circuit either by hand or automatically.

The overload relay is designed to permit the motor to run to its maximum safe temperature before tripping it off the line. One type is a self-contained unit consisting of one, two, or three overload elements, each consisting of a heating unit, a thermostatic strip, and a tripping device. The heating units are heated by the motor current. This heat energy is absorbed by a bimetallic strip that curls or warps, and trips a trigger arrangement. This type of overload relay is not susceptible to faulty operation caused by dust and dirt in the atmosphere. It has heat storage ability, which permits the relay to follow closely the thermal storage ability of the motor. See Figure 4.

Another type of overload relay depends upon the melting of a low-temperature alloy to allow mechanical rotation between two parts normally held rigid when the alloy is cold. These solder-film relays, which are largely used on small manual motor starters, are examples of the fusible-alloy method of obtaining operation at the tripping point. *Continued on next page*

SHORT-CIRCUIT PROTECTION

Motor controls need short-circuit protection. All general-purpose controllers designed to meet the rating standards of NEMA are required to interrupt ten times their normal motor current rating, and in addition to carry for one second fifteen times their motor current rating. Most power sources to which these controllers are connected can supply, under short-circuit conditions, currents greatly in excess of these values. The National Electrical Code requires that an installation be provided with motor branch circuit overcurrent protection for the purpose of protecting the circuit conductors, the motor control apparatus, and the motor against overcurrents due to short circuits and grounds. Obviously, the device installed to fulfill this requirement of the code must be capable of interrupting promptly currents that will flow under short-circuit conditions, and must be capable also of carrying the inrush current when starting the motor.

For low-voltage motor branch circuits, short-circuit protection can be provided by fuses or circuit breakers. The cartridge type of nonrenewable fuse provides a simple method of short-circuit protection to a motor starter. It should be noted, however, that the fuse, as a separate device, only has to interrupt successfully a test circuit that is capable of delivering 10,000 amperes under short-circuit conditions. This value of current is low compared with those found on modern circuits at the conventional utilization voltages.

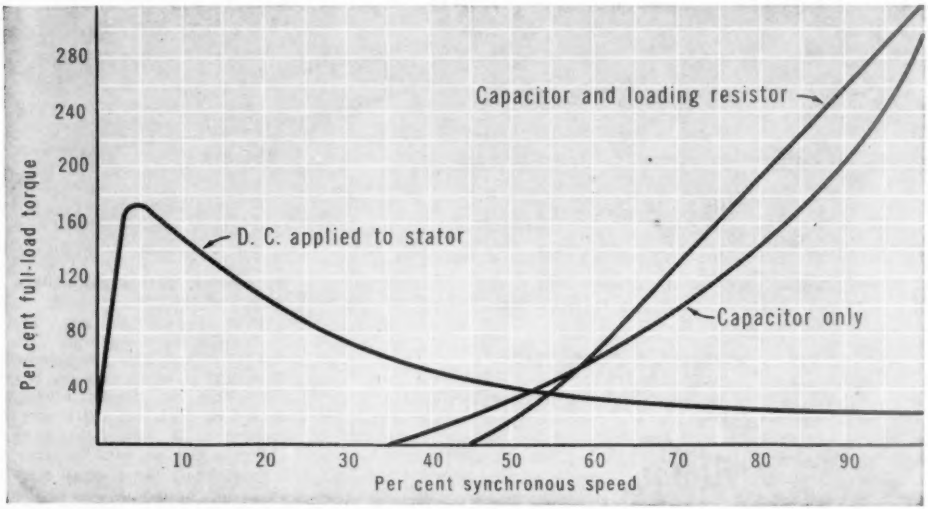
Combination Starters

Combination starters, which include a magnetic starter and a fusible motor switch in one enclosure, are recommended for low-voltage systems having a short-circuit capacity up to 50,000 amperes. This recommendation has been substantiated by considerable test evidence, and takes advantage of the fact that the impedance contributed by the starter limits the fault currents to values that can readily be handled by the code nonrenewable fuse. Consequently, this recommendation presumes the short circuit to occur at a point near or beyond the load terminals of the combination magnetic switch.

Higher Ratings

It should be understood that a short-circuit duty of 50,000 amperes is by no means the upper limit for low-voltage a.c. systems. It does cover, however, short-circuit currents originating from transformer banks up to and including approximately 2000 kva. As the horsepower rating of a combination starter increases, the code fuses required become larger until their current-limiting ability becomes less and their ability to protect motor starters is reduced.

For starters NEMA size 4 and above, the air circuit breaker provides excellent protection and is the preferred motor branch circuit protective device. The speed with which the nonrenewable fuse operates gives it a decided advantage for starters of NEMA size 3 and smaller.



6 BRAKING may be accomplished in several ways. Curves shown here illustrate (1) action when direct current is applied to stator, and (2) use of capacitor connected across stator, with and without a resistor

QUICK-STOP CONTROL

Stopping a motor quickly often is a must in modern industry, especially where split-second timing is important. Sometimes it is necessary to stop a motor at the end of one operation in order to start the next, and a little time saved at each cycle ultimately means greatly increased production.

There are two general methods of braking: mechanical-electric, and electric.

The disk brake is a simple, inexpensive, and widely used type that falls in the mechanical-electric class. These brakes are totally enclosed and dustproof, but since the

amount of heat radiation is limited, they are not recommended for heavy-duty applications.

The shoe-type brake is open to the air, built for long life, and is available for fractional-horsepower as well as large motors. It is operated by solenoids in the smaller sizes and by electro-hydraulic thrust mechanisms in the larger. Solenoid brakes will stop a motor in the shortest possible time, whereas those operated by thrust mechanisms provide smoothness of operation and a short and sometimes adjustable time delay.

All mechanical brakes require periodic lining adjustments and replacement.

For severe duty cycles and high horsepower ratings, electric braking is recommended. This method is very widely used for moving loads that must be stopped frequently. Since there are no friction surfaces involved, lining adjustment and replacement are unnecessary.

There is a choice of several types of electric braking. Plugging is the most popular method of stopping a squirrel-cage induction motor. The power supply of the motor is reversed and the motor is stopped quickly. Since an automatic means of opening the primary connections to cut off the power is necessary, a plugging relay or zero speed switch is used.

With small motors that must be brought to a very quick stop, a time-delay relay can be used to remove power, instead of a plugging switch. Power is first reversed, then removed at a set period of time after the stop button is depressed. A vacuum tube timer will cause the drive to come to zero speed within an accuracy of a fraction of a revolution, if inertia is constant and voltage supply does not vary widely.

A method of electric braking that will not reverse the motor is accomplished by applying d.c. to the stator (Figure 5). Copper-oxide rectifiers for supplying d.c. can be built into the control cabinet, and a timing relay installed to remove the d.c. after the motor has stopped.

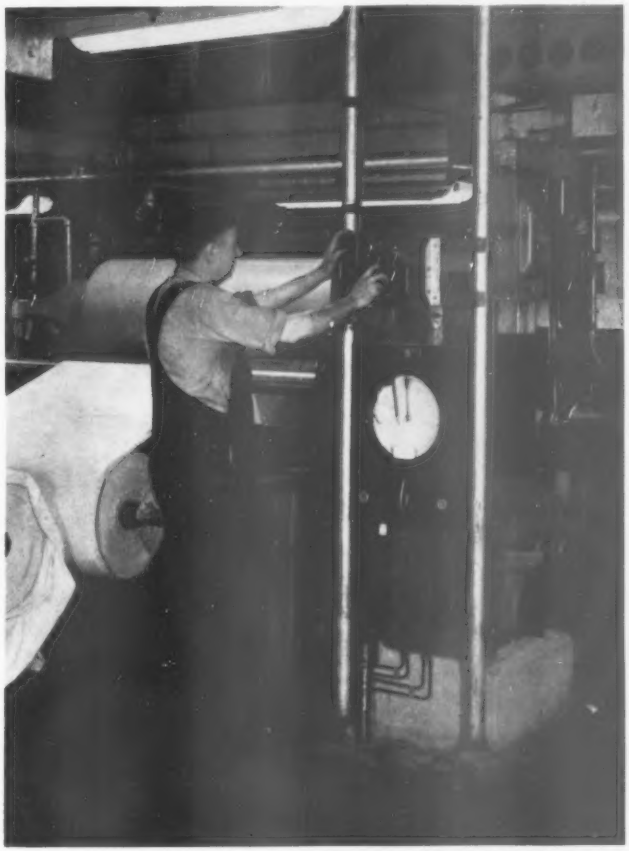
For small squirrel-cage induction motors on heavy reversing cycles, capacitor braking (Figure 6) may be the most suitable. This method requires no relays or other auxiliaries. A capacitor is connected across the stator, causing the motor to act as a generator when it is disconnected from the line. In supplying its own losses it brakes itself.

INTERLOCKING CONTROL SYSTEMS

Controllers often are connected mechanically or electrically for the protection of equipment and operators. Mechanical and electrical interlocks frequently are used together, but their functions are slightly different.

Mechanical interlocking prevents one device from functioning when the other is energized. Electrical interlocking may be set to function in two ways: (1) when one device is energized, the circuit to the second cannot be completed, or (2) the second cannot be energized until the first has been energized.

Interlocking is used where the closing of the two devices at the same time might cause a short circuit or mechanical trouble in the equipment. Although each application must be studied to determine the requirements, the investment for interlocking pays dividends in maximum protection and minimum maintenance.

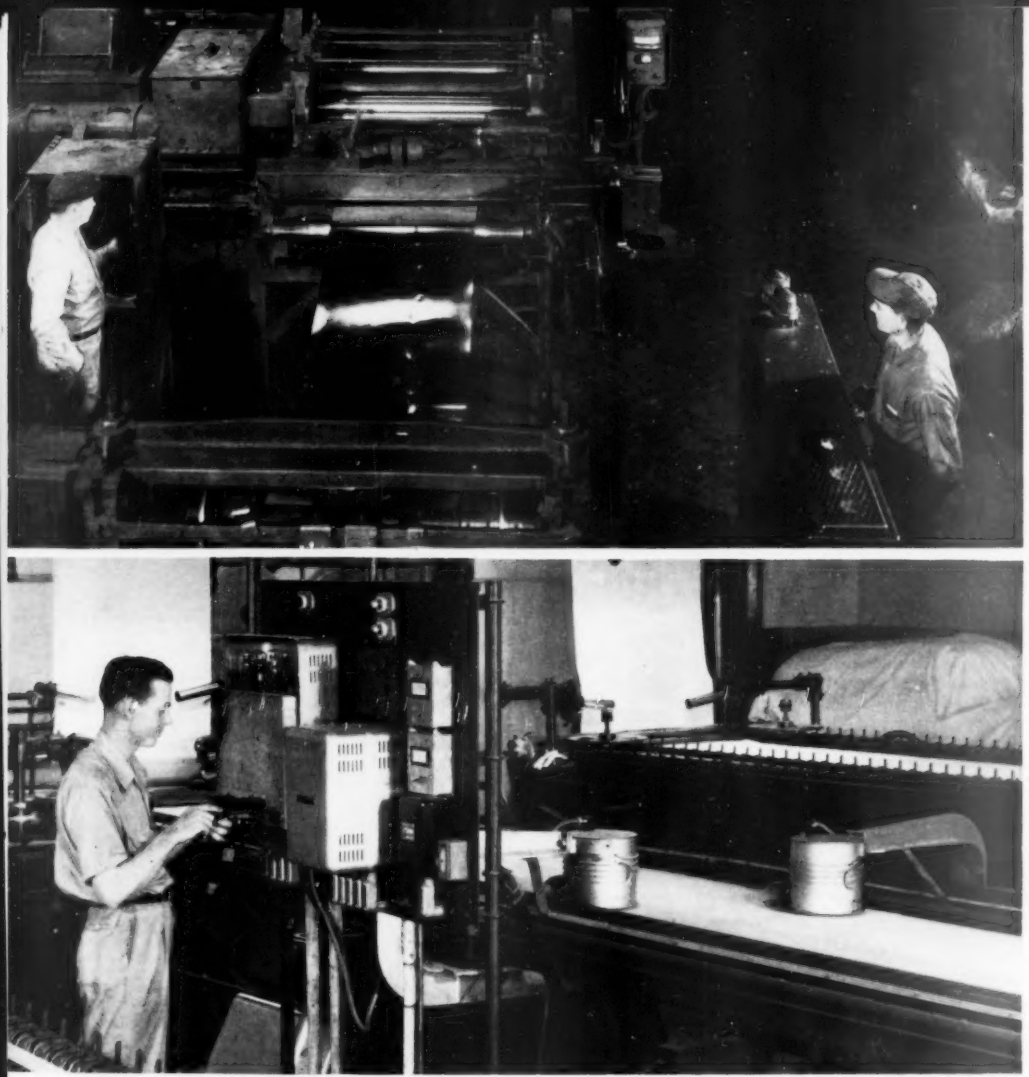


7 ELECTRONIC CONTROL of motor operation offers precise adjustment of speed over a wide range. The application shown here is in a textile mill

ELECTRONIC CONTROL

The possibilities of the electronic tube in industry are too varied to be covered completely here. If a problem arises that seems to defy solution, it might be advantageous to explore the possibilities of electronic control.

Today, electronic control is positioning paper on presses, controlling wire tension, matching dyes, regu-



8 PHOTOELECTRIC CONTROLS serve in many ways. At top is shown equipment that inspects and marks tinplate strip. Weft-straightening equipment in lower photograph is on a 60-ft. tenter in textile finishing plant

lating heat, and measuring currents in billionths of an ampere. The electric eye opens and closes doors, protects water systems, counts livestock, turns on lights, dispenses soap in hospitals, and performs a myriad of other services. Electronic control of resistance welding has increased by 400 to 500 per cent the speed of forming liquid-tight and gas-tight joints.

A completely co-ordinated adjustable-speed drive using electronic tubes as controlled rectifiers converts a.c. to d.c. and, without rotating parts, gives complete control of the motor (Figure 7). A simple single-dial, speed control unit varies the armature voltage at speeds up to motor base speed and field currents at speeds above motor base speed, making it possible to operate the motor over a wide range.

In the production of paper, changes in demand have called for increased speed and larger paper widths. It was necessary to redesign paper machines, which actually are a number of machines operating as a group, so that they operate at higher speed. Electronic controls regulate the speeds of the sectional motor drive and keep all sections exactly in step.

The electronic tube is saving motor and generator windings from damage by moisture in case of leaks in the water pipes of air cooling systems. A moisture indicator, consisting of a control panel and a set of probes, gives warning of the presence of water in the air cooling system before it reaches a dangerous point.

9 CONTROL PANEL shown here actuates the solenoids that control triggers of automatic spray guns for finishing steel shipping containers

CONTROL ACCESSORIES

A broad phalanx of accessories supports and extends the work-simplifying capabilities of control apparatus. Pressure governors and switches send signals to start and stop motors as the level of liquids and the pressure of gases rise or fall. Hundreds of combinations of pushbuttons, indicating lights, and switches are available in all sorts of arrangements. Alarm thermostats sound a warning when temperatures endanger foodstuffs. Limit switches assist in car dumping, hoist controlling, spinning, and limiting all kinds of line motion.

Solenoids stamp blankets, shoot products out of vending machines, cut wires, open gates, sort, and count various products. These simple devices replace complicated mechanisms, take up little space, and do the job automatically and positively. Electro-hydraulic thrust mechanisms give a constant, straight-line pressure thrust to control the brakes and clutches on punchpresses, embossing machines, wire-measuring and cutting, and box machines. Depressing a pushbutton takes the place of manual effort, and a whole system is controlled from a central remote point.

Pushbuttons are the most frequently used pilot devices. These are a class of devices that are connected in the control circuit and mechanically actuate the magnetic contactors and other equipment.

Pushbuttons come in two general types: standard-duty buttons and heavy-duty buttons. Standard-duty buttons are recommended for applications where contactors no larger than 150 amperes are to be controlled, while heavy-duty buttons are suitable for controlling most contactors.

Pushbuttons may be classified again into two other categories: those with momentary contacts, and those with maintained contacts. With a momentary-contact pushbutton the contacts remain closed or open, as the case may be, as long as the button is depressed. With a maintaining-contact pushbutton, the contacts snap open or closed and stay in that position when the button is released. To reverse the action, another pushbutton must be depressed.

A large variety of stations that combine in one enclosure for surface or flush panel mounting almost any desired combination of pushbuttons, selector switches, and indicating lights are available, as well as individual units to be built into machine tools or assembled on panels. There are foot-operated stations, pendant stations, and stations in special enclosures for locations that are dusty, wet, or contain explosive gas or dust.

Another type of pilot device is used to stop and start a motor as a result of some change in the condition of a gas or liquid, rather than by the action of an operator. Pressure switches, pressure governors, and float switches operate in this manner and frequently present a problem in making a choice.

Pressure and vacuum switches are relatively inexpensive devices that open and close contacts upon changes of pressure of any gas or liquid that will not corrode the parts. They will start small motors, or they can be used as a pilot device for controlling an automatic starter.

Pressure governors, somewhat more expensive, give a visual indication of the pressure of the liquid or gas and lend themselves to fine adjustment. They are built for scale ratings between 15 and 10,000 psi., and operating pressures can be set between 20 and 80 per cent of full scale. The minimum difference between contact opening and closing is two per cent of full scale.

Float switches give accurate control of liquid level in open tanks, sumps, or vats whose contents are not subject to freezing. The difference between cut-in and cut-out can be adjusted over a wide range, to the extent of the length of chain available.

Rotary float switches are used by large pumping stations that have a number of pumps operating at different liquid levels in a definite sequence.

The proper combination of control accessories often works wonders in time- and cost-saving. By utilizing two vacuum tube time-delay relays, two magnetic starters, a limit switch and three solenoids, steel containers are automatically sprayed with enamel and sent into a drying oven, with a substantial saving in man-hours and production time (Figure 8).

A limit switch, plugging relay, speed selector switch, pushbutton station, and reversing starter cooperate in the faster and safer production of nuts and bolts.

Motor controls are designed to require as little maintenance as possible. Nevertheless, parts do wear, and fumes, dust, and extreme temperatures can be hard on the equipment. An inspection program, regularly carried on, more than pays for the time it consumes. By uncovering the need for repairs or replacements, breakdowns can be averted.

A preventive maintenance program based on average conditions is outlined here. Operating conditions in a specific plant may call for changes in this program. Experience will show what changes are necessary.

Also, time and trouble will be saved by keeping on hand an adequate supply of spare parts, preferably made by the manufacturer of the equipment, so that they will meet the specifications of the original parts. A recommended list of renewal parts may be included in the instruction book that accompanies the equipment.

Recommended frequency for inspecting controls and what to look for are given in the succeeding pages

HOW TO CARE FOR ELECTRIC MOTOR CONTROLS

1. Magnet-Operated Devices (relays, contactors, solenoids, brakes)

Inspect monthly for:

- Control-circuit voltage
- Accumulations of dirt or gum
- Excessive heating of parts—evidenced by discoloration, charred insulation, or odor
- Freedom of moving parts
- Corrosion of metal parts
- Remaining wear allowance on contacts
- Excessive slam on pickup
- Proper contact pressure
- Loose connections
- Condition of flexible shunts
- Condition of brake wheels and linings
- Condition of arc chutes or barriers
- Worn or broken mechanical parts
- Excessive arcing when opening circuits
- Condition and level of oil (if oil-immersed) Check for presence of sludge
- Condition of gaskets (oil-immersed, dust-tight or watertight units)
- Excessive noise in a.c. magnets
- Evidence of water or liquids falling on control
- Operation—including proper functioning of timing devices, sequencing of devices, etc.

2. Thermally Operated Devices (overload and temperature relays, thermostats)

Inspect monthly for:

- Accumulations of dirt or gum
- Excessive heating of parts—evidenced by discoloration, charred insulation, or odor
- Freedom of moving parts
- Corrosion of metal parts
- Proper contact pressure
- Loose connections
- Condition of flexible shunts
- Worn or broken mechanical parts
- Excessive arcing when opening circuits
- Evidence of water or liquids falling on control
- Condition of heating element
- Condition of control-circuit contacts
- Proper opening of contacts when latching mechanism trips

3. Motor-Operated Devices (timers, rheostats, valves, brakes)

Inspect monthly for:

- Control-circuit voltage
- Accumulations of dirt or gum
- Excessive heating of parts—evidenced by discoloration, charred insulation, or odor
- Freedom of moving parts
- Corrosion of metal parts
- Proper contact pressure
- Loose connections
- Condition of flexible shunts
- Worn or broken mechanical parts
- Excessive arcing when opening circuit
- Condition and level of oil (if oil-immersed). Check for presence of sludge
- Condition of gaskets (oil-immersed, dust-tight or watertight units)
- Evidence of water or other liquids falling on the control
- Operation—including proper functioning of timing devices, sequencing of devices, etc.
- Excessive vibration or noise in operation
- Wear or roughness of sliding contacts
- Condition of gearing (lubricate where recommended)

4. Static Accessories (capacitors, fuses, resistors, transformers, wiring)

Inspect every six months for:

- Accumulations of dirt or gum
- Corrosion of metal parts
- Excessive heating of parts—evidenced by discoloration, charred insulation, or odor
- Loose connections

5. Mechanically Operated Devices (manual starters; master, selector, limit, floor, pressure switches; pushbuttons; rheostats)

Inspect every six months for:

- Accumulations of dirt or gum
- Excessive heating of parts—evidenced by discoloration, charred insulation, or odor
- Freedom of moving parts
- Corrosion of metal parts
- Remaining wear allowance on contacts
- Proper contact pressure
- Loose connections
- Condition of flexible shunts
- Condition of arc chutes or barriers
- Worn or broken mechanical parts
- Excessive arcing when opening circuits
- Condition of control-circuit contacts

Condition and level of oil (if oil-immersed) Check for presence of sludge
Condition of gaskets (oil-immersed, dust-tight or watertight units)
Evidence of water or other liquids falling on the control
Wear or roughness on sliding contacts
Lubricate contacts where recommended

PHOTOELECTRIC CONTROLS

6. Magnetic Relay Contacts

Inspect every one to three months for:

Excessive wear, burning, or pitting. Replace contacts if necessary
Amount of wipe effective on the normally closed contacts of sensitive relays. Adjust clearance by bending armature stop to obtain about 1/16-in. space between armature and contact spring

7. Optical System (light sources, photoelectric tube holders, mirrors, apertures)

Inspect every one to three months for proper alignment of all parts

8. Air Filter (on ventilated cases)

Inspect every one to three months for:

Need for cleaning. If filter cannot be cleaned, replace it with a new one

9. Parts That Transmit or Reflect Light (lenses, photoelectric tubes, mirrors, windows)

Inspect every one to six months for:

Dust, oily film, or any foreign matter that restricts the passage of light
Clean the surface. If oil film is present, use a suitable solvent
Take care not to scratch plastic surfaces. Clean with an air supply or dust lightly with a cloth or brush. If necessary to use water or solvent, rub surface very carefully so as not to cause abrasive action of material being removed. Replace all scratched or broken glass or plastic parts

10. Control Panel (photoelectric tube holders and other electronic equipment)

Inspect every one to six months for:

Presence of dirt, metallic dust, and other foreign material (Because of the high impedance of most electronic circuits, such accumulations may cause trouble. The presence of moisture will make the condition much worse. Give particular attention to the photoelectric portion of the circuit.)

11. Connections to Terminals

Inspect every three to six months for:

Need for tightening. Under vibration these connections may become loose

12. Mechanical Auxiliaries

Inspect every three to six months for:

Contact wear, loose parts, proper lubrication, any abnormal condition

13. Light Source Lamps

Replace every 1000 to 3000 hours

14. Vacuum Tubes

Test every 1000 to 3000 hours to determine need for replacement

STRADDLE TRUCK with extension shoes carries oil drums. Forty drums have been transported and it is expected that 60 can be carried

LONG LOAD consists of 56 crates on fourteen pallets. Weight of ten

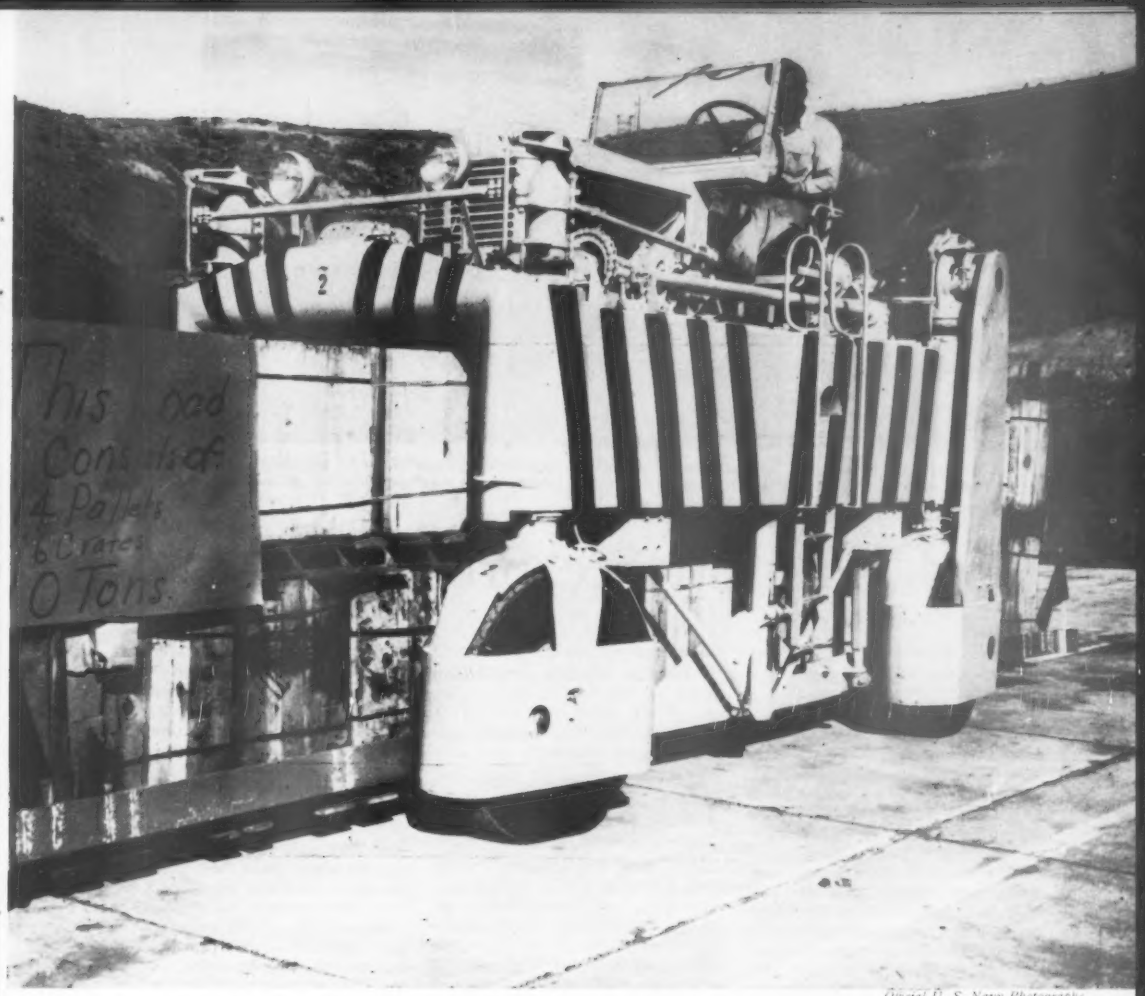
Extension Shoes Help Straddle

The familiar straddle truck, designed primarily to transport lumber, is fitted with attachments to carry heavy palletized loads in U. S. Navy operations

AN ADAPTATION of the straddle truck makes use of the addition of extension shoes. These shoes project the regular gripping shoes of the truck, both in front and in back, so that longer loads can be picked up and carried. The use of extension shoes was conceived by the United States Navy, and the machines illustrated in this article are Navy property, so equipped.

Straddle trucks were first used for straddling and transporting lumber piled on bolsters or supporting platforms. This experience of the Navy shows how the straddle truck can be applied to jobs in manufacturing plants. By using the extension shoes, 4x4-ft. pallets, with an overhang of three inches all around, can be used.

The Navy found, in moving ordnance materials over a standard trip of a mile and a half from ware-



Official U. S. Navy Photographs

tons is carried with aid of special extension shoes. These shoes project the regular gripping shoes of the straddle truck, both in front and in back, so that longer loads can be picked up and carried securely

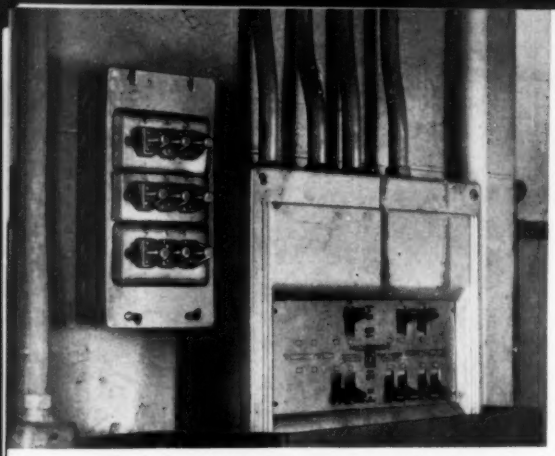
Trucks Carry Bigger Loads

house to pier, that one truck equipped with extension shoes could consistently move more than 100 tons per hour. This machine kept a fork lift truck busy at each end of the haul, in cooperation with a crane that loaded the palletized materials onto barges. Before adding the shoes, the same operation required two carriers and six skids or bolsters.

From the Naval Fuel Annex at Richmond, Calif., comes information concerning another use of the extension shoes. In this instance, drums of petroleum products are handled on 48x72-in. pallets. Forty filled drums loaded on pallets are picked up and transported in a single trip. It is expected that the number of drums will be increased to 60.

By elimination of the larger skids, bigger pay loads will be carried because of the lighter weight and smaller dimensions of standard pallets. Faster turn-around is permitted, since there is no necessity to wait for the unloading of skids. Also a steadier riding effect in crossing tracks is reported.

Adapter shoes can be installed or removed by one man in from fifteen to twenty minutes by the use of 1-in. bolts, one in each lumber carrier shoe and one in each extension shoe. No changes need be made in the truck except for the addition of the four bolt holes.



PILOT WARNING lights, one for each phase, signal blown fuses at main and branch circuit panels

ACCESSIBLE LAMPS over assembly and workbenches permit relamping and cleaning without aid of a ladder

This Maintenance Program Limits

WILLIAM GROSS • MAINTENANCE MANAGER, EMERSON RADIO & PHONOGRAPH CORPORATION, NEW YORK

OUR COMPANY IS PROUD of its continuous production record. Many years have elapsed since production in any of the many departments at Emerson Radio was interrupted for more than a three-minute period. Three factors have made this record possible: (1) a maintenance department that is well organized and trained; (2) insistence upon strict adherence to a policy of preventive maintenance; (3) every feasible provision for easy inspection of all equipment and quick replacement of defective units. Obviously, an adequate stock of spare equipment and parts has been necessary to carry out such procedures.

In order to turn out from 10,000 to 15,000 radio receivers a day, all production and assembly operations must proceed smoothly and at a carefully scheduled rate. According to the common practice in plants of this type, each production worker performs one or two operations and then passes the work on to the next one. A department or group runs from 100 to 300 workers.

Obviously, failure of a riveting machine or a soldering line would tie up a whole department in a comparatively short time if the trouble were not cleared up promptly.

The personnel of the maintenance department is divided into the following groups, with definite primary responsibilities:

Electricians. They are responsible for installation and care of all electrical equipment, including the private automatic telephone system.

Mechanical maintenance. This department takes care of installation, inspection, and repair of all non-electrical production and service equipment, such as riveting machines, machine tools, pneumatic screwdrivers and nut runners, and conveyors.

Machinists. This group overhauls and makes replacement and spare parts for all mechanical equipment. It may also be called on to do work on component parts of radio sets obtained from outside suppliers, when these parts do not meet specifications in every respect.

Air conditioning. The men in this group are responsible for operation and care of two 40-ton air conditioning units for the offices. Also, they are in charge of the air compressors and the extensive compressed air piping system.

Carpenters, painters, and plumbers. These groups are responsible for all work that is the normal function of such categories.

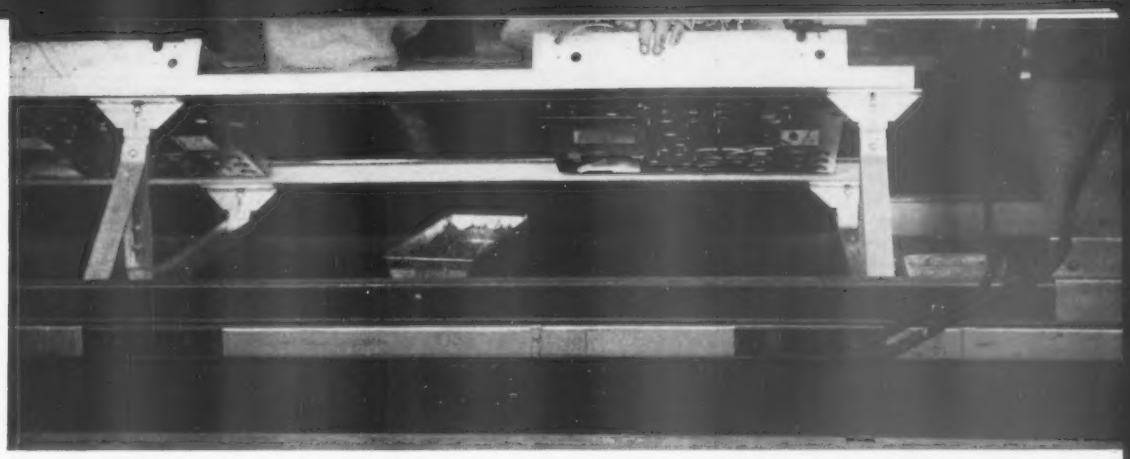
All the work groups mentioned are organized as units under the direct supervision of a group leader. The best or most experienced man in each group is trained to take the place of the leader when the latter is absent. With this arrangement there is no likelihood that any group will be left under any circumstances without an experienced leader who knows the work and can take responsibility.

Members of the maintenance department work under a merit rating system, which gives them plenty of incentive to keep on their toes. Each man's work is reviewed every three months. If his performance and capabilities warrant, he is transferred to the next higher grade with an increase in pay.

Better results are obtained at Emerson by having the maintenance men specialize on one or two kinds of equipment. For example, certain men work exclusively on riveting machines, while other men in the same group work solely on some other type of equipment. Some are assigned exclusively to cleaning, relamping, and maintenance of the lighting system. And, as mentioned before, others are assigned to and devote all their efforts to the air conditioning and the compressed air systems.

This method of organizing the work makes experts of the men and assures highly skilled attention to all equipment.

Although the electrical department is primarily in charge of all electrical equipment, putting responsibility for proper operation of motors and starters on both the



REPLACEABLE RACEWAY comes in 10-ft. sections to facilitate changes in location or rearrangement of benches. In cases of failure, units can be interchanged easily, with minimum loss of production time

Delays to Three Minutes

electrical department and the mechanical maintenance department effectively eliminates "buck passing." Thorough familiarity with the equipment makes it possible for a maintenance man to detect abnormal conditions immediately. Any such condition is corrected on the spot, or the machine is replaced at once.

The maintenance department is organized and equipped to replace practically any machine or motor in very short order.

Preventive Maintenance

A rigidly enforced preventive maintenance program that has been carefully worked out has long been in effect in this plant. Every piece of production or service equipment has a record card. This card carries all pertinent details, together with the dates for lubrication, inspection, and overhauling. Space also is provided for entering the dates and results of inspections and all repairs.

In accordance with the company policy of delegating responsibility and authority as widely as good management permits, these record cards are kept by the leader of the group, who is responsible for the equipment. For example, the leader of the electrical group keeps the cards of all electrical equipment, the mechanical maintenance group leader keeps the cards for all riveting machines, punch presses, and so on. Every morning the cards for the equipment to be serviced that day are pulled out and distributed among the men.

The equipment record cards specify definite dates for inspection, lubrication, or other attention, according to the preventive maintenance program. The work called for on these dates must be done and checked off. The maintenance manager goes over all the equipment record cards at frequent intervals, to make sure that the preventive maintenance program is carried out in every detail.

In reality, however, practically all equipment, particularly all important items, is under almost continuous observation. The inspectors and repairmen patrol their areas several times a day, each one carefully observing the operation of the machines or equipment under his care. He is responsible for seeing that the machines are lubricated and that the driving motors on the machines are operating properly. Any trouble with the electrical equipment on the machines must be reported at once to the electrical department.

Simplified Inspection

The third factor mentioned at the beginning of this article—provision for easy inspection and quick replacement of any equipment—involves various expedients. For example, the fluorescent lighting fixtures over the assembly and workbenches are mounted low enough to permit relamping and cleaning without the use of a ladder.

While machines must in many cases be installed close together, care is taken to leave ample room all around for inspection and any repair work that may be required.

Many assembly benches are equipped with single-phase power outlets for soldering irons, nut runners, and other small tools. To provide this service has required the installation of thousands of feet of metal raceway fitted with outlets. This raceway comes in 10-ft. lengths. A type of raceway is used that permits quick, easy replacement of any section should the conductors or outlets become defective. This feature is valuable also when changes are made in the location or arrangement of benches.

Immediate detection of power outages due to fuse blowouts or other causes is important, particularly with the soldering operations. Here a power failure might not be noticed until the irons cool off.

To insure almost instant detection of blown fuses, all main and branch circuit panels and fuse boxes are equipped with 1/10-watt neon pilot lamps, one lamp in each of the three phases. These boxes are located on walls and building columns, in plain sight of foremen and operators. An unlighted lamp is certain to be noticed at once. Then a call to the electrical department will bring an electrician literally on the run with new fuses and whatever else may be needed to clear up the trouble.

What the Hoover Report

Mr. Hoover says it points the way to savings of $3,000,000,000. Other authorities say it could easily be $4,000,000,000. It could therefore well mean a 10 per cent saving in industry's tax bill

CHARLES B. COATES • VICE CHAIRMAN AND GENERAL MANAGER, CITIZENS COMMITTEE FOR THE REORGANIZATION OF THE EXECUTIVE BRANCH OF THE GOVERNMENT; FORMER ASSOCIATE EDITOR, *FACTORY*

ON MAY 25 HERBERT HOOVER and Associates, management consultants, called at the White House to deliver the final installment of a massive nineteen-part blueprint for lasting good government. Few events of recent years have held such significance for industry.

For the twelve members of the Commission on Organization of the Executive Branch of the Government, the last installment brought to an end the most meaningful fact-hunt in the history of government. For the American people, in whose behalf President Truman, Vice President Barkley, and Speaker Rayburn accepted the report, it renewed the nation's option on economic and political liberty.

Will we take up that option? We'd better. Without a well-managed government we can never hope to nail the flag of freedom securely to the national mast.

This is, admittedly, a dramatic way in which to discuss anything so drab as a government report. As a matter of fact, the Hoover Report, by all past standards, *should* have been duller than dull. But it wasn't. Instead it hit the headlines and became, much to the amazement of its authors, a "best seller." On February 7, when the first installment was delivered to Congress, there was a line of eager readers nearly a block long outside Washington's Government Printing Office waiting to buy copies.

Since then, as any Congressman will tell you, an unprecedentedly enthusiastic reception by public and press has placed the Hoover Report among the top issues of the day.

Why? Near the surface are many good reasons. Public confidence was inspired by the bi-partisan set-up of the commission, by the caliber of its personnel, and especially by the alliance in a good cause between an incumbent President and an Elder Statesman.

The scope and validity of the basic research were likewise impressive. This research was performed by special committees, called "task forces," numbering some 300 of the best-qualified specialists in America. They peered into every nook and cranny of the ramshackle structure called the Executive Branch. And they reported in 2,000,000 well-documented words that it was as termite-ridden as the White House itself.

Finally, the Hoover Report findings were stated wtih a clarity which left no doubt of their purport in the mind of anyone old enough to read or wise enough to vote. Yet all these factors, important as they are, don't quite account for such a sudden surge of public concern.

$1 in $5 for U. S.

What then? Well, isn't it just possible that we are witnessing a great national awakening to the stark facts of simple arithmetic? When the piper presents his bill, we find that two plus two still equals four, in millions or billions—in money, marbles, or chalk. If I have five apples but somebody takes one of them away before I can eat it I don't have five apples. I have four apples and I want to know what happened to the other apple. Today the federal piper takes one dollar in five of national income.

An awakening of this kind cuts across partisan, factional, and occupational lines. In twenty years of depression, war, emergency, and cold war we have seen the national tax bill—and also the number of taxpayers — increase ten-fold. Income earners in all brackets, and their wives, have suddenly realized that the piper must be paid.

This need not be a conscious reaction. The average citizen may not know the figures. He may not be able to tell you that two decades have seen the federal budget rise from $4 billions to $42 billions, the payroll from 600,000 to 2,100,000 and the federal debt from $16.5 billions to $251 billions. He may not be able to enumerate a handful of the 1812 scrambled board, bureaus, agencies, and administrations which comprise the Executive Branch. Nevertheless he bumps into the government everyhere. And he becomes aware that it costs money even when it does things for him.

There is further evidence of a general awakening in the unanimity with which Americans have flocked to the banner of our new Citizens Committee for Reorganization. The major forces in the national community have endorsed the committee's new educational campaign in behalf of the Hoover Report.

Yet tax-consciousness may not be the whole answer. Dollars-and-cents considerations are compelling beyond doubt. But other and equally significant factors lie deeper than that.

Dr. Robert L. Johnson, national chairman of the Citizens Committee, puts it this way:

"A free people must have confidence in their government if they

Means to Industry

Fabian Bachrach

Charles B. Coates has been assistant director of public relations of the General Foods Corporation since 1945. For the seven preceding years he was associate editor of FACTORY. His articles on labor relations, public relations, and taxation won national awards for the publication, and his writings on industrial mobilization, manpower, priorities, and reconversion brought praise from high government and industrial figures.

Before coming with FACTORY Coates was a reporter and editor of several newspapers, including the Bronx Home News, the New York American, the Montclair (N. J.) Times, and the Brooklyn Daily Eagle.

During the past year, Coates served as a director of publicity for the Hoover Commission. His present appointment as general manager of the Citizens Committee is a direct result of the intimate knowledge of the work of the commission gained during that period.

intend to stay free. They can have confidence only in a government which they can understand. . . . Today we are uneasy about our government, bewildered by its size, baffled by its complexity, and frightened by its cost."

Among its many merits, the Hoover Report gives us a chance to examine our government in Town Hall terms. Bear in mind that the commission was primarily engaged in finding and analyzing facts. Herbert Hoover and Associates did on a large scale what their industrial counterparts have always done. They kept challenging every operation, every method, every procedure. And eternally, they asked "Why?"

Billion-Dollar Questions

Why should it cost two-and-one-half cents to print and deliver a penny postcard, and who pays the difference? Why should the Army ask funds for 829,000 tropical uniforms, more uniforms than there are soldiers, at $129 apiece? Why should a single farmer get five different kinds of advice about fertilizer from five different agents representing five different field forces of the same agency?

Why should the Veterans Administration need four times as many people to handle a given number of insurance policies as do private companies—and then take four times as long to pay claims? Why should huge hospitals be built adjacent to existing huge hospitals when there are neither patients, doctors, or nurses enough to fill either of them? Why should such hopitals cost from $20,000 to $51,000 per bed when private hospitals average $16,000 per bed?

And so it goes. The Hoover Report contains hundreds of such examples. No jury in America would blame a wife for leaving a husband who managed his affairs along government lines, nor would any man be compelled to put up with "housekeeping" of the government variety in his own home. No industrial concern could survive under government management methods.

How long would *your* company last:

—if the personnel department recruited thousands of people, sight unseen, in distant cities and put them to work for people *they* had never seen after months of form-filling on the part of all hands?

—if it had a personnel turnover of 500,000 per year on the one hand, while, on the other, it might take several months to get rid of an obvious incompetent?

—if scores of different departments kept scores of different types of budgets, making comparison and analysis impossible and giving no clue as to the end-purpose for which funds are asked?

—if 1700 different systems of classifying and cataloging various types of property were simultaneously maintained in different departments?

—if inventories having a probable total value of $29 billions were lying around, although no one person or department had any real idea as to where or what these inventories might be?

—if the company paid interest on its own money by investing its surplus in its own bonds?

—if the three major department heads, after being told they could budget a total of $15 billions, came back with budget estimates totaling $30 billions?

—if the heads of 65 major departments reported directly to the President, who is held directly responsible for their detailed operation even though his authority over

many of them is very nominal and sometimes is openly defied?

But why go on? Obviously any company so operated would soon be in receivership and the receiver would be looking for expert help. If, then, a consultant were called, he would begin right where the Hoover Commission began, with an attack on the basic organizational structure. It is literally impossible to draw a rational organization chart of the Executive Branch today. No wonder, then, that the commission declared:

"The nation is paying heavily for lack of clear lines of authority and responsibility, and a lack of effective organization in the Executive Branch."

The commission then recommended a reordering of departments, eliminating duplication and overlapping, to reduce to workable proportions the number of officials reporting to the President and to establish the flow of authority and responsibility up and down the line from the Chief Executive to the office boy. Without this necessary first step, reforms in methods and procedures cannot be successfully instituted.

Concrete Examples

Next the commission proposed the use of modern management techniques throughout the government in personnel, budgeting and accounting, purchasing, records management, and all the other so-called "housekeeping" functions of government. Then it went from department to department looking for —and finding—countless concrete opportunities to simplify activities and reduce costs.

What savings can be realized through the Hoover Report? The commission officially dodged the question because some of the task forces submitted estimates while others did not. Mr. Hoover has expressed the belief that such savings could easily amount to $3 billion. Others, among them Dr. Johnson, believe it could just as easily be $4 billion. Certainly a 10 per cent reduction in costs would be the least one would expect to gain from a management survey of an enterprise so sorely in need of reorganization.

Now what does all this mean to industry? Why should this seemingly academic question of government management, a field long reserved for the theorists of political science, suddenly loom as a subject of vital concern to active industrial management?

1. A 10 per cent reduction in the corporate tax bill is well worth having for its own sweet self alone.

2. It costs industry a great deal of money and time to deal with an inefficient and badly organized federal government.

3. If the government could attract and hold good men in key positions (the means to which is pointed out in the Hoover report), industry would suffer far less from aimless and harmful rulings and regulations by the boards and bureaus with whom it must deal.

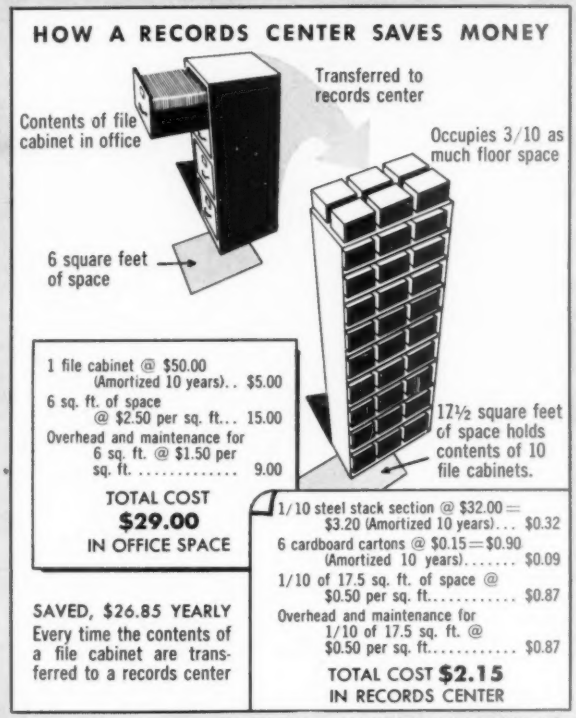
4. Wise use by government of the nation's material resources is vital to industry from now on—as we learned in the war—because scarcities mean controls over both supplies and prices. Only a well-organized, well-run government can be expected to strike a fair balance between public and private needs.

Who Shall Be Master

We live in a new situation. Big government is now a fixed feature of the landscape and the only question remaining is whether it shall be our servant or our master. At the heart of the whole situation is the relationship between industry, the chief producer of taxable income, and government, the chief consumer. We have lately seen situations in which appointed officials

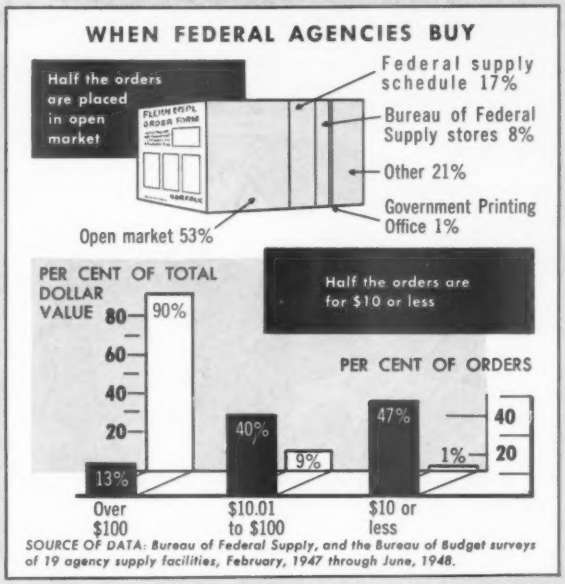
How long would your company last—

IF it kept 330,000 files of useless documents in office space when it could keep them in warehouses at a yearly saving of $26.85 per cabinet?


HOW A RECORDS CENTER SAVES MONEY
Transferred to records center
Contents of file cabinet in office
Occupies 3/10 as much floor space
6 square feet of space
1 file cabinet @ $50.00 (Amortized 10 years).. $5.00
6 sq. ft. of space @ $2.50 per sq. ft... 15.00
Overhead and maintenance for 6 sq. ft. @ $1.50 per sq. ft. 9.00
TOTAL COST $29.00 IN OFFICE SPACE
17½ square feet of space holds contents of 10 file cabinets.
1/10 steel stack section @ $32.00 = $3.20 (Amortized 10 years)... $0.32
6 cardboard cartons @ $0.15 = $0.90 (Amortized 10 years)..... $0.09
1/10 of 17.5 sq. ft. of space @ $0.50 per sq. ft..... $0.87
Overhead and maintenance for 1/10 of 17.5 sq. ft. @ $0.50 per sq. ft..... $0.87
TOTAL COST $2.15 IN RECORDS CENTER
SAVED, $26.85 YEARLY
Every time the contents of a file cabinet are transferred to a records center

From "The Hoover Commission Report," McGraw-Hill Book Co.

IF it spent more than $10 to process each of the several million purchase orders issued annually, when almost half of the purchases are for less than $10?



SOURCE OF DATA: Bureau of Federal Supply, and the Bureau of Budget surveys of 19 agency supply facilities, February, 1947 through June, 1948.

YET that is precisely what the U. S. Government is doing today. These are but two of literally hundreds of such examples unearthed by the task forces of the Hoover Commission. Concludes the author: "To men who know the vital importance of sound management organization in industry, no more need be said"

literally had the power to determine by a simple interpretation of the prevailing tax laws whether or not most of our major industries would run at a profit or at a loss in a given year. Life-and-death decisions affecting industry can be, and often are, made outside management's sphere of authority.

It is almost too trite to repeat that "the power to tax is the power to destroy," but we need to keep reminding ourselves that industry's continued usefulness to the national economy depends on its ability to improve its productivity through investment in better equipment and better methods. If taxation chokes off capital improvement, the final result is declining productivity, lowered living standards, increasing government controls, and, finally, nationalization of industry.

Whether nationalization of industry is a good thing or a bad thing is not the point at issue here. The immediate question is simply this: What is industry's stake in the Hoover report; and the answer is, basically: "Its own freedom."

To repeat: Every important element of our economy has its own special interest in good, economical, and effective government. A large peacetime military establishment cannot be maintained beyond the national capacity to sustain it. Large-scale social objectives, in the form of health and welfare projects, cannot be realized beyond our capacity to pay for them. Farm subsidies lose their effect if revenues are insufficient.

All these and other claims upon the services of government can only be balanced by a government that is, first of all, well-managed. That is the real point of the Hoover report and that is its real importance —not simply to the farmer, not simply to industry, not simply to the veteran, the trade unionist, or the welfare worker—but to all of us.

Basic Freedoms at Stake

A badly managed, badly organized government can lead us into war or depression simply because its chain of command, its communications, and hence its decisions, are weak. We can lose the very freedoms we seek to preserve through sheer misuse of our resources. A well-managed, well-organized government, on the other hand, can lead us and the world on the high road to real progress and prosperity.

One of the things that lifts the Hoover report far above the level of dull, technical analysis is the fact that the men who wrote it were thinking beyond its factual contents to its meaning in human terms. Here is a quotation from the initial report for all to ponder:

"The critical state of world affairs requires the Government of the United States to speak and act with unity of purpose, firmness, and restraint in dealing with other nations. It must act decisively to preserve its human and material resources. It must develop strong machinery for the national defense, while seeking to construct an enduring world peace. It cannot perform these tasks if its organization for development and execution of policy is confused and disorderly, or if the Chief Executive is handicapped in providing firm direction to the departments and agencies.

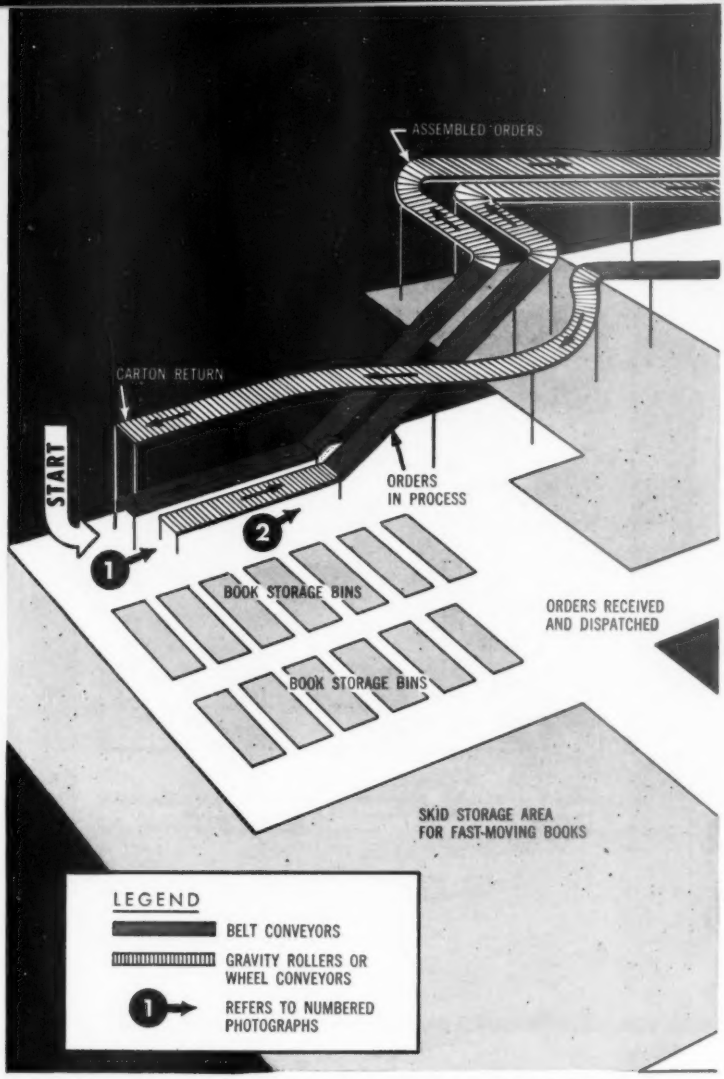
"If disorder in the administrative machinery makes the Executive Branch of the Government work at cross purposes within itself, the Nation as a whole must suffer. It must suffer—if its several programs conflict with each other and executive authority becomes confused—from waste in the expenditure of public funds, and from the lack of national unity that results from useless friction."

To men who know the vital importance of sound management organization in industry, no more need be said.

1 START OF CONVEYOR LINE. Roller conveyor holds cartons while clerk begins assembly of order

2 DOUBLEDECKED to save space, upper conveyor line returns the empty cartons to be reused

3 GRAVITY moves cartons over large part of system. Belt conveyors lift them to high points

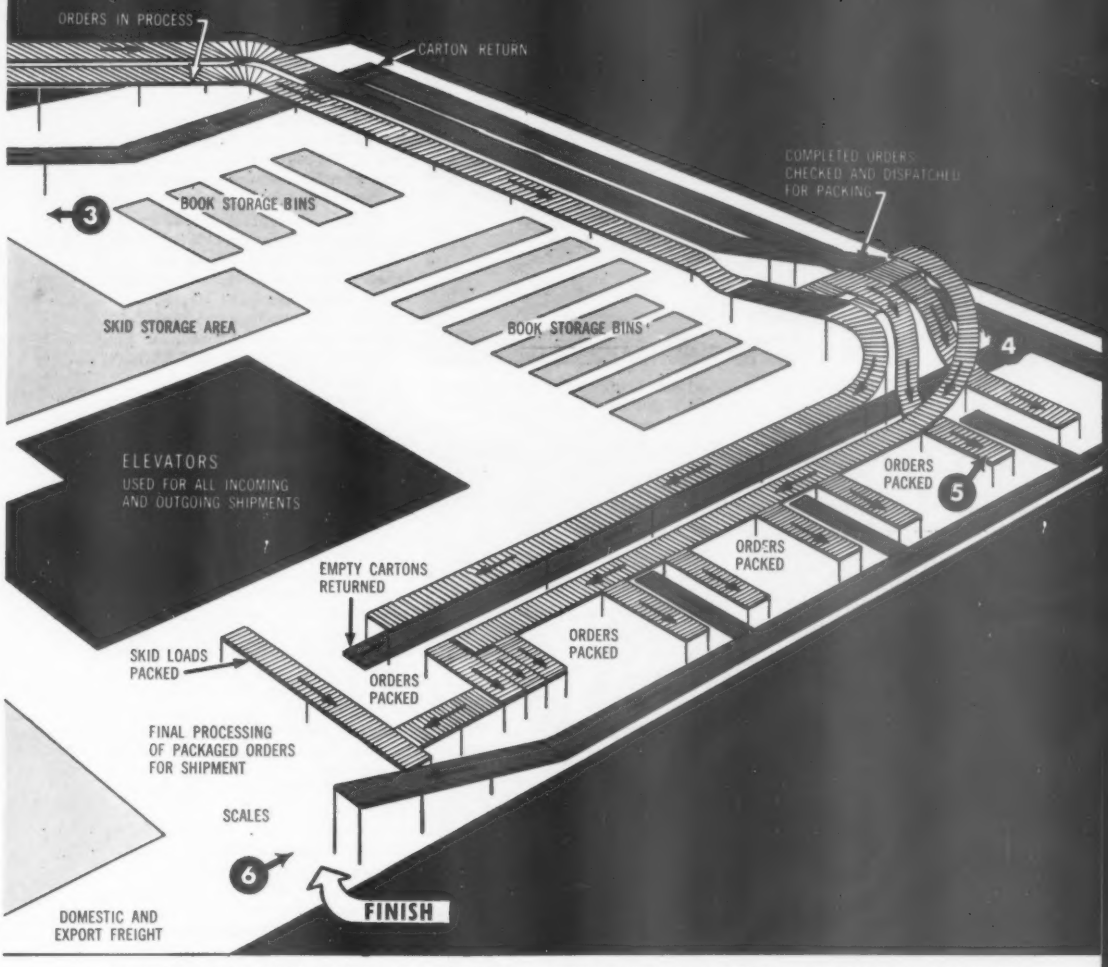


BOOKS FLOW SMOOTHLY ALL THE WAY FROM STORAGE TO FINAL PROCESSING

More Speed and Space

New conveyorized shipping layout permits McGraw-Hill Book Company to handle up to 8,000,000 books annually, with great savings over old method

JOHN J. DALY • SHIPPING MANAGER, McGRAW-HILL BOOK COMPANY, NEW YORK



CONVEYOR SYSTEM HUGS WALLS, TAKES LITTLE SPACE. PHYSICAL EFFORT IN ASSEMBLING ORDERS IS CUT TO MINIMUM

With Mechanized Shipping Layout

How to boost shipping capacity without using additional direct labor or floor space? The shipping department at McGraw-Hill Book Company did it by conveyorizing its operations. Physical effort involved in assembling orders for packing was halved and efficiency was increased 100 per cent.

Better utilization of space permitted the stocking of some 300 additional titles, an increase in storage capacity of 15 per cent. Men released from the tedious jobs of selecting and packing were given better jobs as planners and expediters. Orders move faster, with fewer mistakes.

Books are moved on skids from the binders to McGraw-Hill's 34-story mid-Manhattan building. Fast-moving titles remain on skids. Other titles are stored in steel bins. Incoming orders for books range from one copy to thousands of copies, in one or more of 2500 titles.

Under the old system, wooden bins were used to hold books. Shipping clerks transferred books from bins to hand trucks. These trucks, when full, were pushed to the packers. Packers unloaded the trucks, and wrapped or packed

4 CHECKING STATION is maze of conveyors. Lifting of heavy cartons is virtually eliminated. From here orders are shunted to proper packers

5 PACKER GETS BOOKS from roller conveyor (foreground). They are wrapped and dropped down chute to belt conveyor beneath table

6 FINISH OF LINE is mailing table where packaged books are processed for shipment. Hand trucks carry packages to elevators

books individually in cartons for shipment. Aisles were too narrow and traffic was congested. It was difficult to meet shipping dates.

Under the new system, all is changed. Wooden bins came out, steel bins with greater capacity went in. Hand trucks were eliminated for all but bulk shipments. Some 1525 usable feet of belt, roller, and wheel conveyors were installed. A new layout simplified flow.

Refer to the diagram. It shows conveyor lines around three walls of the department. Book bins are placed six feet apart in three locations along the path of the conveyors. Orders are obtained by clerks from a dispatcher near the start of the line. Assembly of orders starts at the last bin, WXYZ. Books are selected from bins and placed in cartons on the roller conveyor (Figure 1). Clerks operating in each section check orders and add books accordingly as cartons roll from section to section. By the time cartons reach bin A, orders are complete. At the far right in the diagram is the checking station (shown in detail in Figure 4). There, orders are checked for completeness and sized for packing. An intricate pattern of roller conveyors at this point permits the checker to segregate and shunt orders to various packing lines. Packers, upon receiving books from the checker, prepare them for shipment. Books then travel down short lengths of roller conveyor to belt conveyors (Figure 5), which carry them to the main belt conveyor.

Provisions have been made to handle full-carton loads in a similar manner. The routing, however, is slightly different.

Skid Loads Save Time

Those titles having a rapid turnover are stacked on skids in special storage areas and carton-lots are removed as required to a roller conveyor near the end of the main line. There they are checked, packed into cartons, and rolled onto the main belt.

At the end of the main belt conveyor, orders are weighed and prepared for shipment. It is a short distance from the mailing table to outgoing elevators.

This new system has enabled the company to increase shipments up to 50 per cent in peak periods, with only 20 per cent of the overtime formerly required. Flow is uniform and work loads have been balanced at each work station.

PREMIUM POSTING SHEET Department *Molding* For week ending *1/30/49*

CLOCK NO.	MONDAY			TUESDAY			WEDNESDAY		
	Hours on Day Work	Hours on Standard	Earned Credit Hours	Hours on Day Work	Hours on Standard	Earned Credit Hours	Hours on Day Work	Hours on Standard	E
9	8.0	8.0	10.0	8.0	7.0	9.1	8.0	6.0	
10	5.5	4.0	5.1	8.0	7.9	10.2	8.0	8.0	
13	8.0	6.5	6.9	8.0	8.0	8.0	8.0	8.0	
16	8.0	8.0	8.4	8.0	8.0	9.6	8.0	8.0	
17	8.0	7.2	7.0	8.0	7.8	7.6	8.0	8.0	
21				7.5	—	—	8.0	—	
23	8.0	6.9	7.2	8.0	7.0	7.4	8.0	7.0	
24	8.0	8.0	8.7	8.0	8.0	9.2	8.0	7.7	
27	8.0	2.9	3.1	8.0	7.0	6.6	8.0	8.0	

1 EMPLOYEE PERFORMANCE CONTROL is achieved by use of a premium posting sheet, prepared daily for each department and posted on bulletin boards. Employees can tell at a glance just where they stand. This cuts grievances, since questions are raised before details can be forgotten by those involved

Using Control Reports to Improve Incentive Administration

J. W. BRADY • CHIEF INDUSTRIAL ENGINEER, EMERY INDUSTRIES, INC., CINCINNATI

THE MOST DIFFICULT PHASE of wage incentive application is the administration of the plan, not the development of the standards. It is after the standards have been set that the significant managerial function begins. To fulfill this function, current and complete information is needed, in the form of incentive control reports.

To be effective, such reports should provide factual data of direct benefit to three groups:

1. Employees. Individual employees should know where they stand at all times.

2. Supervisors and staff management. This group should be enabled to keep in close touch with both individual and departmental performance as well as day-work figures.

3. Top management. Major executives should have full facts on wages being paid and the means by which employees have earned them.

For sound guidance of these three groups, Emery Industries uses five imple and inexpensive forms:

1. Premium posting sheet. This report is prepared daily by a payroll clerk and posted on departmental bulletin boards. Separate sheets are made up for each department. Each employee is thereby enabled to tell at a glance how many hours he worked on daywork and on standard and how many extra hours he has to his credit.

If the employee questions any figure, he reports at once to his foreman, who checks with the payroll or industrial engineering department. This report has virtually eliminated post-payday arguments. By permitting questions to be raised while details are still clear in everyone's mind, problems are easily settled.

2A. Department summary. At the end of each week the daily premium posting sheets are summarized for each department and distributed to all management personnel. This department summary gives over-all departmental figures as well as the weekly record of each employee. The figures in the "% Performance" column are determined by dividing hours on standard into hours earned. The per cent of incentive coverage (top center of report) is found by dividing hours on standard by hours worked. Similarly, hours earned divided by hours on standard gives department standard performance and the sum of hours earned and hours on daywork divided by total hours gives departmental actual performance.

2B. Plant summary. Each week all department summaries are tab-

A **DEPARTMENT SUMMARY · LABOR PERFORMANCE**

Department 22 Molding Incentive coverage 87.0% Week ending 1-30-49

Total hours 704.0 Hours on standard 612.8 Hours Earned 655.6 Hours on day work 91.2

Department standard performance 107.0% Department actual performance 106.1%

No.	Name	Hours Worked	Hours on Standard	Hours Earned	% Performance
9	J. Schmidt	32.0	28.2	31.4	111.3
10	W. Jones	37.5	34.9	42.5	121.8
12	C. Jackson	40.0	38.5	36.9	

B **PLANT SUMMARY · DEPARTMENT PERFORMANCE** Week ending 1/30/49

Department	Hours Worked	Hours on Standard	Hours Earned	Hours on Day Work	Standard Performance	Incentive Coverage
20-Sanc. Light	74.4	23.8	26.8	50.6	112.6%	32.0%
22-Molding	704.0	612.8	655.6	91.2	107.0%	87.0%
26-Dipping	1196.4	927.8	1178.0	268.6	127.0%	77.5%
32-Beeswax	304.0	285.6	228.6	18.4	80.0%	93.9%
34-Shrink Lights	742.0		761.8			98.0%
Plant Total	8044.0	6571.0	7107.0	1473.0	108.2%	81.7%

Plant actual performance 109.5 Productive actual performance 107.3

C **DAY WORK ANALYSIS** Week Ending 1/30/49

Department	Description	Occurrences	Total Hours
20 Sanc. Lights	Make 7 day Beeswax Wick	2	5.0
	Make 7 day Beeswax Lights	3	45.6
		Total	50.6
22 Molding	Waiting on stock	4	7.6
	Clean pouring valve	2	2.6
	Clean [illegible] valves	[illegible]	[illegible]

2 DEPARTMENTAL PERFORMANCE CONTROL is achieved by use of three reports (above) showing department and plant performance in summary form and analyzing daywork for guidance of supervisors and industrial engineering staff. Daywork analysis helps to highlight weak spots in incentive coverage

ulated as totals on a plant summary report form. This report shows total man-hours worked in the plant during the previous week and highlights performance and incentive coverage. It is an excellent guide to top management because it puts a large amount of essential data in capsule form for ready reference.

2C. Daywork analysis sheet. Here is shown every item allowed as daywork, along with the frequency of occurrence of each and the total time involved. This report has two functions. It enables the industrial engineering department to concentrate its efforts on the daywork problem. It also enables production management to get a clear picture of the miscellaneous activities taking place in the plant.

FACTORY PAYROLL ANALYSIS

Period January, 1949

Item No.	Item Description	This Month		Last Month		Year to Date		To Date Year Ago	
1	Direct Labor Payroll	25,268	25	37,618	72	305,968	82	201,134	70
2	Indirect Labor Payroll	15,500	68	17,688	92	154,524	16	102,850	34
3	Total	40,769	18	55,287	64	460,492	98	303,985	04
4	Direct Labor Incentive	3,353	92	3,731	72	39,005	74	27,434	06
5	Indirect Labor Incentive	204	14	168	12	2,825	92	2,103	40
6	Service Incentive	121	38	109	24	2,320	50	1,769	62
7	Maintenance Incentive	193	94	244	50	3,760	18	2,786	36
8	Total Incentive	3,873	38	4,253	58	47,912	34	34,093	44
9	Total Payroll	44,642	56	59,541	22	508,405	32	338,078	48
	Item (1) ÷ Item (3) = %	61	98	68	04	66	44	66	17
	Item (2) ÷ Item (3) = %	38	02	31	96	33	56	33	83
	Item (3) ÷ Item (9) = %	86	59	87	73	81	41	80	47
	Item (4) ÷ Item (8) = %	5	27	3	95	5	90	6	17
	Item (5) ÷ Item (8) = %	3	13	2	57	4	84	5	19
	Item (6) ÷ Item (8) = %	5	01	5	75	7	85	8	17
	Item (7) ÷ Item (8) = %	91	32	92	86	90	62	89	92
	Item (8) ÷ Item (9) = %	8	68	7	14	9	42	10	08
	Item (8) ÷ Item (3) = %	9	50	7	69	10	40	11	22
	Item (4) ÷ Item (1) = %	13	27	9	92	12	75	13	64
	Item (5 + 6 + 7) ÷ Item (2) = %	3	35	2	95	5	76	6	47

3 PAYROLL CONTROL is achieved by use of a factory payroll analysis, issued monthly. This report gives over-all labor cost data, with breakdowns by major incentive categories. To facilitate comparisons, relationships between key items are expressed in percentage terms in lower half of report

3. Factory payroll analysis. This report is distributed to top management once a month. Its main purpose is to show the relation of incentive wages to the total wage bill. For this reason it is essentially an incentive report rather than a routine payroll analysis. The upper half of the report gives dollar expenditures for direct, indirect, and total payroll, and for various incentive categories. The lower half expresses certain key relationships in percentage terms to simplify analysis and help management see the complete picture.

Taken all together, these five reports provide all the essential facts needed for successful incentive administration. They guarantee balanced coverage, from shop worker on up to top management, each level receiving needed information on an orderly basis.

A Four-Week Training Program in Quality and Methods

British concern gets workers to look at the job critically and ask themselves: Is this the best way? Am I wasting my efforts? Need it be done at all?

FREDERICK W. REILLY · WORKS MANAGER, KRISSON PRINTING, LTD. LONDON, ENGLAND

THIS IS THE STORY of an intensive training program, lasting four weeks, carried out by the staff of Krisson Printing, Ltd. It had two main objectives:

1. To raise still further the quality of Krisson printing.

2. To refine and improve our methods of work.

Two weeks were devoted to each of these aspects, and all sorts of methods were used to bring home the lessons. Here is a brief description of the course.

1. RAISING QUALITY

As was stressed in the opening session of the program, our quality is already high. During the past year we produced some first-class print. But because our standards satisfy our customers, that is no reason why we should not set ourselves even higher standards. *There is no ceiling on quality.* So the objective of these two weeks was to find ways and means of doing better work.

Quality Competitions

Checks on quality were imposed, in the form of competitions. In the composing room there were prizes for the compositor with the smallest number of errors in a day's typesetting (the winner's score was one error!); for the most accurate setting of "reprint" copy; for the best interpretation of a very rough layout; and for rating in order of merit six typographical layouts.

In the pressroom our best craftsman spent all his time checking quality. He assessed every pressman on the quality of his make-ready and his percentage of spoilage. He also rated the hour-by-hour cleanliness of every machine. This was a most valuable contest.

In the bindery every girl ran 10,000 sheets of the same job on the folding machine, and was rated on the number of sheets spoiled. The winners scored 100 per cent.

The messengers were brought in with a check on sweeping, waste disposal, and tea-making. (No prize for the quality of the tea.)

"Customer Trouble" was a sketch put on by the office staff to emphasize that every printing order is very important to *someone*—the man who pays the bill. A customer was seen placing an order. The salesman took all the details, but made errors here and there. The various foremen brought up all sorts of apparently insuperable snags, and the salesman airily "let them go." When the job was finished, everything was wrong. In stormed the "customer" and volunteers from the audience bravely but vainly tried to calm him down and explain the reasons for the faults. At the end, the production staff had a better idea of the reason for the office's frequent insistence on apparently unimportant points, which are nevertheless of great importance to our customers.

"The Story Behind a Print Order" was a talk intended to show how the printing is sometimes only a small part of the total job.

Starting with a buyer conceiving the *need* for a piece of print, the speaker followed the job through all its stages before it reaches the printer. All the time—through conferences, rough layouts, estimates, finished layouts, artwork, photography, and engraving—money is being spent. And all this expenditure of effort and cash is placed in our hands for printing. How important, then, that we should give of our best.

2. IMPROVING METHODS

During this fortnight we were not concerned with production records or intensified efforts. We turned critical eyes on methods, operations, and processes. Though we knew they were already of a high standard, they could be a great deal better. What we wanted were refinements, innovations, and streamlining, to keep down costs and so prices.

Each department had several sessions of evening classes on motion study. The main idea was to get everyone to realize that motion study is not exclusively the concern of engineers with sliderules, stop watches, and microfilm analysis. The big advances are made not by elaborate investigations and expensive new equipment, but by every operator asking himself: "Need I do so much running about? Can I place my tools nearer? Am I doing this job the best way?" In our firm all the improvements have been brought about by people asking the right kind of questions. If only we can get people *asking the questions*, the answer is a comparatively easy matter.

Existing methods and equipment were demonstrated and the motion-study principles behind them were explained. Then it was shown how this equipment came into being only because someone *questioned* the previous method. When his question had shown the need, re-

designing was a technical matter.

At many of the classes, individual members took turns at demonstrating motion-study principles in their work or in their homes. Even toast-making and sock-darning came into the picture.

Supplementing these classes were the daytime activities. In each department one member was appointed each day to be a "methods critic." He was at liberty to walk around his department looking for wrong working methods, wasted motions, or misplaced equipment. This was a most valuable idea. Everyone took it in good part. It couldn't have been pleasant for a skilled man to have his work criticized by an apprentice; but it was done, and many lessons were learned.

At the same time competitions were going on. In each department there was a prize for the best ideas for saving time and energy and for improving machines or work layout. Some first-rate suggestions were put forward, and the maintenance section now has a long list of new projects on hand.

The two "features" during the week were lessons from our associate firm, Dexion, Ltd. The first was a talk, aided by a motion picture, of an investigation into the packing of nuts and bolts. It was a classic story of great increases in production obtained without the use of new equipment, merely by studying the method, rearranging or eliminating processes, and improving the works layout.

The second feature dealt with the achievement of straight-line production in the manufacture of Dexion Steel. In the early days each machine had its own loading and take-away operation. Now the process, from coil to slotted and angled length, is continuous and untouched by hand. There is no backtracking, no double handling, no storage of half-completed parts. The factory is built around that idea. It is motion study *really* working.

Out of all these activities emerged one continuous theme: *Don't just do your job. Look at it critically.* Ask:

Is this the best way?
Am I wasting my efforts?
Need it be done at all?
Who? what? when? why? where? how?

GETTING CUSTOMERS' VIEWPOINT

All this was done inside our own organization. But for the biggest event we reached out and brought in the people who really mattered. We invited three customers to come and constitute a "brain trust" and help put over their side of the picture to our production staff. They were a little taken aback; but though they knew no punches would be pulled, they were ready to have a go.

It was a roaring success. Some of the questions were very pointed:

"Why do so few customers consult their printer before having blocks made? They are always the wrong size and cause endless trouble and waste."

"Are these rush jobs from advertising agents really urgent, or does the agent just want to impress his client?"

The brain trust (all agents) answered manfully, and managed to put a new viewpoint to the audience. When it came to deciding whether quality or price was more important in keeping a customer, everyone agreed that quality came first. There will always be printers ready to cut prices, but they can't all do first-class work. The printer who does a high-quality job at a reasonable price will always have work. Since this is Krisson's idea, we were glad to hear it confirmed by our customers.

Perhaps the most unusual feature of the evening was that, after we had asked the visitors to criticize our work, *they* asked us to criticize theirs! It was a remarkably frank discussion — and it made many friends. Our production staff had met the people who buy their efforts, and both sides had learned something.

It Takes Profits to Replace Old Machines

As TANGIBLE EVIDENCE of industry's difficulties with high taxes and inadequate depreciation rates, Lockheed Aircraft Corporation, Burbank, Calif., cites this example in its 1948 Annual Report to Employees.

Under the head "It Takes Profits to Replace Old Machines," Lockheed tells about two lathes, an old one and its replacement . . .

"Worn out now, this lathe, from Department 1501, cost $3672 in 1941. [A photograph of the lathe was shown]

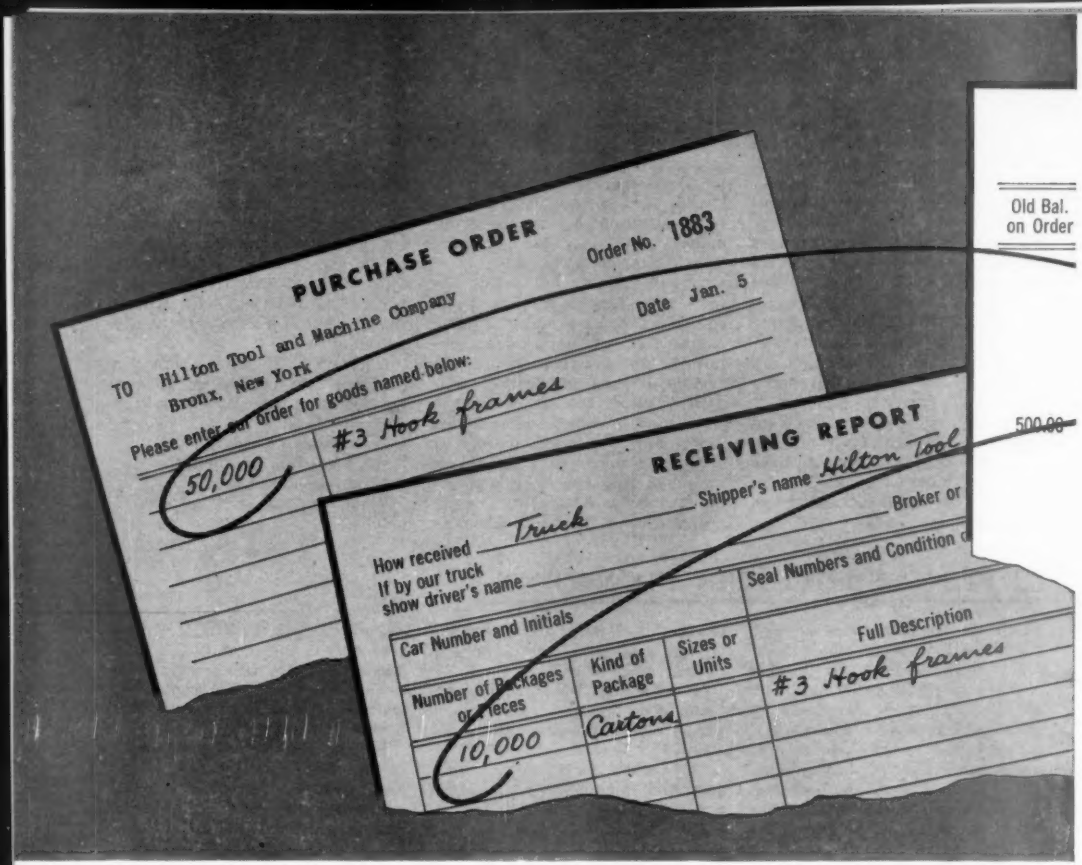
"During the years since 1941 the Treasury Department allowed us to recover out of profits, prior to taxes, our original investment of $3672 for the day when the lathe must be replaced.

"Because the lathe was worn out, and because new and improved models are essential to meet competition, we took this $3672 to purchase a replacement. [A photograph of the replacement lathe was shown]

"But . . . the replacement lathe, in 1948, cost $14,699!

"Consequently, to buy this new lathe, it took not only the $3672 reserve money, but an additional $11,027. This $11,027 had to come from profits. But our profits were subject to 40 per cent income tax—so to get the needed $11,027 we had to make a profit before taxes of $18,378.

"It took $18,378 profit to replace just one medium-price machine. If such conditions continue, we will need $27,000,000 during the next six years to replace wornout machines and equipment which originally cost only $12,000,000. If we are going to meet competition, and if you are to have a modern and up-to-date plant in which to work, the difference, or $15,000,000, must come from net profits—$2,500,000 a year."



QUANTITY FIGURES FROM THE PURCHASE ORDER, THE RECEIVING REPORT, AND THE STOREROOM REQUISITION ARE

Simplified Stock and Accounting

POSTINGS to ledger, statement, and journal are made simultaneously

ANY ORGANIZATION that triples its size within a year is certain to have control problems. Management at U. S. Stagalite Company minimized these growing pains by careful planning and preparation.

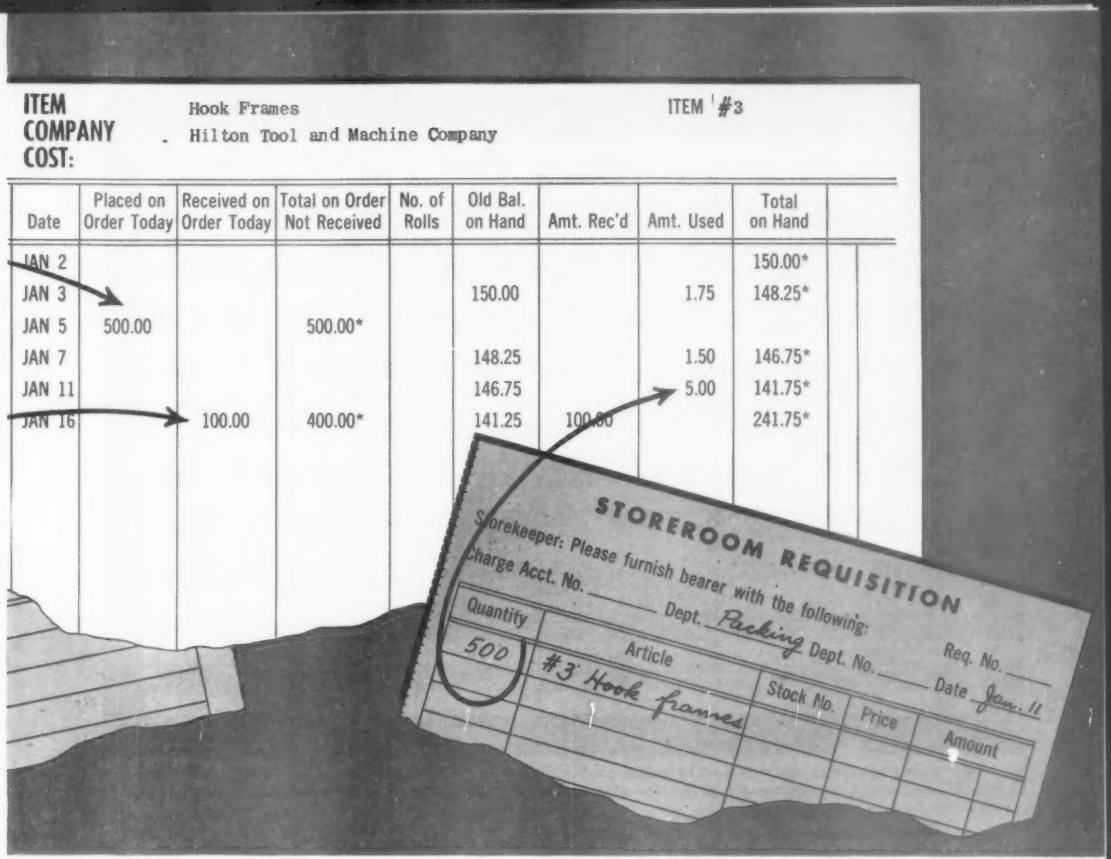
As demand for its newly diversified products increased, employment also grew—from 50 to 150 skilled women operators. Daily accounts receivable postings mounted from around 100 to more than 300. And problems of inventory became more complex as additional items were added to the line.

Management found the solution in a double-pronged control plan of accounting, designed not only for immediate needs, but highly flexible for the future.

Using hand-posted ledger cards, the stock clerks had difficulty staying up to date and in balance with physical inventory on the slightly more than 250 items carried. Every week, one of the girls from the office had to take the stock records, audit them, and bring them into balance. This meant next to no stock control and a haphazard inventory system.

Under the new set-up, each of the stock items carried has its own stock control ledger card, similar to the one illustrated above.

Using the figures shown on the receiving reports, the accounting machine operator picks up the old balance on order, which is printed on the stock ledger form


ITEM Hook Frames ITEM #3
COMPANY COST: Hilton Tool and Machine Company
Date | Placed on Order Today | Received on Order Today | Total on Order Not Received | No. of Rolls | Old Bal. on Hand | Amt. Rec'd | Amt. Used | Total on Hand
JAN 2 150.00*
JAN 3 150.00 1.75 148.25*
JAN 5 500.00 500.00*
JAN 7 148.25 1.50 146.75*
JAN 11 146.75 5.00 141.75*
JAN 16 100.00 400.00* 141.25 100.00 241.75*
STOREROOM REQUISITION
Storekeeper: Please furnish bearer with the following:
Charge Acct. No. Dept. Packing Dept. No. Req. No.
Date Jan. 11
Quantity 500
Article #3 Hook frames
Stock No. Price Amount

CONSOLIDATED ON STOCK CONTROL LEDGER FORM, THE BASIS OF THIS SIMPLE INVENTORY CONTROL SYSTEM

Control in a Small Plant

inserted in the machine's front-feed carriage. The machine prints the date automatically. As the figures are indexed and posted for goods placed on order or received, the machine automatically tabulates from column to column, adding the figures for goods ordered, and subtracting (by printing in red) the goods received. The total-on-order-and-not-received figure is computed and printed at the touch of a single key.

The right side of the stock ledger form is similarly computed, using requisitions on the stockroom as a posting media. Picking up the old balance figure, any shipments received and added to the stock are entered on the form and added to the total shown. As items are withdrawn from stock, they are subtracted (by printing in red) to arrive at a new total figure for goods on hand.

The last column on the stock ledger form is blank, and is used for periodic computations of the value of inventory—a job done merely by extending the total-on-hand figure with the unit cost for each of the items. The company takes inventory three times a year, but a total inventory value figure can be had within a few minutes at any time.

Stagalite also uses the machine for controlling accounts receivable. With a slight mechanical change-over of the bars controlling the machine carriage tabulation—an operation of less than 30 seconds—each of the active receivables can be posted and kept in balance daily, eliminating any trial balance difficulties. The statements, ledger, and proof journal are posted simultaneously. The proof journal for the day's entries remains in the carriage while the other forms are inserted and aligned. Tabulation, computation, and printing are performed in the same manner as with the inventory records.

Formerly, all receivables were hand posted, and required a full-time receivables clerk. One girl can now handle not only the receivables, but also much of the other office work.

Navy Number	Given Color Name	Tentative Federal Color Card Symbol	Reflectance Y	Adopted Munsell Notation		
				Hue	Value	Chroma
1	Light green	L 82	0.55	5.7 G	7.8	1.7
2	Medium green	L 83	.25	4.2 BG	5.3	1.6
3	Deep green	G 60	.141	5.0 BG	4.0	1.3
4	Soft yellow	Sg 28	.75	4.0 Y	9.2	5.5
5	Medium tan	G 61	.21	7.9 YR	5.1	3.7
6	Light ivory	L 23	.75	2.0 Y	9.0	3.8
7	Peach	L 2	.64	6.8 YR	8.4	4.4
8	Terra cotta	G 62	.20	1.8 YR	5.0	4.0
9	Pearl gray	L 61	.46	N	7.2	
12	Spruce green	G 63	.147	8.5 GY	4.0	1.8
13	Fire red	G 7	.074	6.5 R	2.9	16.0
14	Brilliant yellow	G 43	.58	5.0 Y	8.2	12.2
15	Vivid orange	G 10	.23	0.9 YR	5.2	16.0
16	Bright green	G 64	.26	4.0 G	5.6	4.4
17	Clear blue	G 65	.19	2.2 PB	4.7	6.2
18	International orange	G 9	.147	9.0 R	4.3	15.5
19	Light navy gray	Sg 3	.28	N	5.8	
20	Medium navy gray	G 31	.144	N	4.4	
21	Deep navy gray	G 30	.066	N	3.0	
22	High-light buff	G 48	.55	3.2 Y	7.8	3.6

The chart shows specifications of standard colors used by the U. S. Navy for painting all properties of its shore establishments. Numbers 10, 11, and 23 are not shown, since they have no industrial application

A Guide to Good Use of Color in Painting the Plant

Research in color painting sponsored by the U. S. Navy has resulted in standard procedures in its use of color. This article summarizes those parts of the official report that might be applied to advantage in any industrial plant

SPECIFICATIONS FOR COLOR PAINTING of its shore establishments have been issued by the U.S. Navy primarily to promote worker-safety and efficiency. Their development is based upon sound engineering principles governing the functional use of color. The research was done by Faber Birren & Company.

Elaborate color schemes have been avoided because they involve the maintenance of extensive and costly paint inventories. Excluding white, black, and aluminum, the full report recommends 23 standard colors, of which 20 have industrial applications covered herein. These colors are listed in the chart above, which specifies the standards for shade of color only, and not for paint finish or paint quality. Choice of paint finish (such as flat, medium gloss, or high gloss) rests largely on the type of operation or service and exposure to dirt or contaminants as balanced against any undesirable effects of glare.

Color recommendations are definitely related to types of artificial light sources. In general, the 3500-deg. fluorescent lamp is preferred, but the 4500-deg. lamp may be used in offices. The daylight fluorescent lamp is suggested only where color discrimination is important. The use of the soft-white lamp is limited to cafeterias and restrooms. If regular mercury-vapor lighting is used, colors such as yellow, ivory, tan, peach, and terra cotta should not be employed.

In general, do not paint masonry unless higher light

reflectance and better color treatment are necessary. Natural-finish woodwork may be finished by staining, varnishing, and rubbing, in accordance with the character of the surroundings.

INDUSTRIAL AREAS

Three major principles of color (No. 1, 2, and 3) and three supplementary principles (No. 4, 5, and 6) are presented to meet practically any requirement or operating condition.

Principle 1. *White overhead; #1 light green, upper portions of walls; #3 deep green, dado and trim.*

Adapted to normal shop facilities. Best under average working conditions where there is concentration of personnel. Suitable for practically all climates except excessively cold or cloudy regions. Soft tones of bluish green are ideal to establish a comfortable working environment. Wall and column glare will be minimized and brightness extremes reduced in relation to machinery and equipment.

In buildings with flat, saw-toothed, or arched roofs or low monitors, use #1 light green for walls from dado to plane of bottoms of roof beams or trusses; white for all surfaces above the plane, including underside of roof, steelwork, and windows; #3 deep green for dado (a height of about four and a half feet), door frames, and windows below roof beams or trusses. Do not apply dado stripes.

For high-bay buildings, use white above plane of bottom of crane runways. (In buildings with little wall or bulkhead area, principle 1 may not be practical; use principle 4 or 5 as alternate).

Crane runways and crane beams, being exposed to oil, should be painted #20 medium navy gray.

For machinery, use scheme A or C (page 127). Equipment fixed against walls should match dado. Free-standing and movable equipment should be painted #20 medium navy gray.

Dado color, being grayish in tone, will effectively conceal oil, dust, or soiling.

Typical applications: shops of all kinds used for production, maintenance, or repair, such as machine shops; carpenter, cabinet and upholstery shops; printing shops; inspection and control roofs; laundries; populated storage areas.

Principle 2. *White overhead; #1 light green, upper portions of walls; #2 medium green, dado and trim.*

Recommended for shops where there is a concentration of personnel, where high maintenance standards are followed, or where good housekeeping and appearance are necessary because of finer operations or exacting visual tasks. Such conditions call for comfortable levels of brightness on walls, equipment, and machinery. Not practical where work involves heavy machines or excessive exposure to oil or dirt. Best with light-colored floors, to reduce shadows and dark contrasts which handicap seeing. Suitable for most climates, except very cold or cloudy regions.

For walls, use #1 light green from dado to plane of bottoms of roof beams or trusses; white for all surfaces above this plane, including underside of roof, steelwork, and windows; #2 medium green for dado, doors, door frames, and windows below roof beams and trusses. Do not apply dado stripes.

For crane beams and runways, use #19 light navy gray. Also employ this color on machinery and equipment, to get bright reflectance and encourage greater cleanliness and care, as in scheme B (page 127). Do not paint floor; but if paint is necessary, use #19 light navy gray or #20 medium navy gray.

With a bright floor, brightness ratios will be within acceptable limits. Wall reflectance of about 55 per cent will reduce glare and assure ideal visibility of average materials, without offering distracting or trying contrasts.

Typical applications: machine shops doing fine tool work; material and testing laboratories; instrument shops; engine test cells; communications rooms; testing and inspection of electrical equipment, optical equipment, or plastics; sewing operations; areas where there is excessive heat.

Principle 3. *White overhead; #4 soft yellow, upper walls; #5 medium tan, dado and trim.*

Recommended for shops where average temperatures are cool, also for areas where greater lighting efficiency is wanted because natural or artificial light intensities are low. Best suited to large rather than small spaces. It gives a warm tone and overcomes any vault-like feeling. Although a white wall has maximum efficiency in reflection of light, it may create glare and unfavorable contrast with surroundings, and cause lower working efficiency in highly populated areas. Where warmth and brightness are needed, #4 soft yellow gives a cheerful and sunny appearance without excessive wall glare.

In buildings having flat, saw-toothed, or arched roofs or low monitors, use #4 soft yellow for walls from dado to plane of the bottoms of roof beams or trusses; use white for all surfaces above this plane, including underside of roof deck, steelwork, and windows; use #5 medium tan for dado, doors, door frames, and windows below roof beams or trusses.

For high-bay buildings, use white above plane of bottom of crane runways. (In buildings with little wall or bulkhead area, principle 3 may not be practical; use principle 4 or 5 as alternate.)

Crane runways and beams, being exposed to oil, should be painted #20 medium navy gray.

For machinery, see directions in principle 1.

Typical applications: shipping areas; dye plants; photography rooms (yellow absorbs ultraviolet radiation); plants with vault-like interiors.

Principle 4. *White above dado and on all overhead construction; #3 deep green for dado, doors, door frames, and windows partially within dado area, and for equipment fixed against walls and bulkheads; #20 medium navy gray for crane beams and runways, and for free-standing and movable equipment; scheme A or C for machinery.*

Suitable for large shops with high bays or high overhead construction, and for spaces with extensive fenestration, because extension of color to great heights creates an unfavorable appearance. Also gives best light. May be used for erecting, assembly, and repair shops and hangars that adjoin spaces treated in accordance with principles 1 and 2. Applicable in areas with fairly high personnel occupancy.

Typical applications: High-bay machine and assembly shops; boiler rooms and power plants; engine and compressor rooms; garages.

Principle 5. *White above dado and on all overhead construction; #20 medium navy gray for windows partially within dado area, doors, door frames, and equipment such as bins, racks, and shelving.*

Recommended for spaces where comparatively few personnel are employed, such as storage buildings.

Since glare is not a problem, paint finishes may be glossy to reduce dust and lint-collection.

Typical applications: Plating and battery rooms, storage areas.

Principle 6. *White above dado and on all overhead construction except steelwork; #20 medium navy gray for dado and trim, steelwork below dado, and equipment (other than heated surfaces); aluminum for overhead steelwork and heated surfaces; scheme A or C for machinery.*

Suggested for shops where heat, fumes, smoke, or soot exist, and walls and ceilings are difficult to keep clean. Special aluminum or other heat-resistant finishes may be necessary on equipment exposed to high temperatures.

Typical applications: foundries; forge shops; blacksmith shops; smelting shops; heat-treating areas.

ADMINISTRATIVE AND PERSONNEL AREAS

While diversity of colors is desirable, by keeping the number of colors to a minimum the amount of paint maintenance is reduced without sacrifice of attractive and functionally correct results.

Principles 7, 8, 9, 10, 11, 12. *White ceilings and #19 light navy gray trim, except windows, in all cases. Color of walls and windows for each principle is given below. In all cases, #19 light navy gray for equipment. A dado of trim color may be added to principles 7 to 11 to hide soiling.*

Especially applicable to large areas, such as offices, drafting rooms, laboratories, and training rooms. White ceilings may be extended to tops of picture mold or to bottoms of beamed ceilings. Radiator color should match wall or trim.

Principle 7 *(#1 light green)* is best for facilities where personnel is concentrated, and especially desirable for sunny exposures because it has a cool quality and will reduce glare.

Principle 8 *(#6 light ivory)*, high in light reflectance, is suitable for rooms without good illumination.

Principle 9 *(#9 pearl gray)* is satisfactory for smaller rooms with strong light and sunny exposure.

Principle 10 (*#7 peach*, a direct complement of principle 7), is best for spaces having little or no sunlight, and for areas occupied largely by women.

Principle 11 *(white)* is suitable for kitchens, vaults, storage areas, and basements.

Principle 12 *(#6 light ivory, with optional #19 light navy gray for dado and #20 medium gray for stairs and balustrades)* is adapted to corridors and stairways. Where practicable, paint the soffits or undersides of stairs and landings white.

Principles 13, 14, 15, 16, 17. These principles are in effect an extension of principles 7 to 12 and may be used with one another in adjacent areas. They employ distinctive colors for trim, rather than gray only. Color of walls and trim for each prinicple is given below. In all cases ceilings are white, and radiators should match walls or trim.

Principles 13 to 17 lend themselves to special facilities, such as restrooms, toilets, washrooms, conference rooms, and cafeterias.

Principle 13 *(#1 light green or white walls with #2 medium green or white dato and trim)*. Suitable for men's washrooms, locker and toilet rooms. All white surfaces are an alternative. Toilet stalls may match trim or be painted #6 light ivory. Locker equipment may match trim or, as an alternative, may be painted #19 light navy gray.

Principle 14 *(#7 peach or white walls with #8 terra cotta dado and trim)*. Designed for women's washrooms, locker and toilet areas. Toilet stalls may match trim or be painted #6 light ivory. Locker equipment may match trim or be painted #19 light navy gray.

Principle 15 *(#7 peach walls with #8 terra cotta trim)*. Appropriate for cafeterias. Dado optional. Equipment and furniture may be white or #19 light navy gray.

Principle 16 *(#6 light ivory walls with #5 medium tan or #6 light ivory trim)*. Available as an alternate to principles 13, 14, and 15, with or without dado treatment, when warmer treatment is desired. Equipment may be #19 light navy gray.

Principle 17 *(#2 medium green for walls and trim)*. Suitable for reception and conference rooms and lobbies.

DISPENSARY AND FIRST-AID ROOMS

Special colors should be applied in these areas. All ceilings should be white. Make trim #19 light navy gray. Walls should be white in examining and accident rooms; #1 light green in sick bays and physiotherapy rooms; #7 peach or #6 light ivory in dressing rooms; #6 light ivory or #9 pearl gray in offices.

MISCELLANEOUS OUTSIDE STRUCTURES

Lighter tones are preferred to darker colors because of better appearance and greater practical value. The safety code (page 127) must be followed as well in all cases, to mark accident hazards.

High structures *(#12 spruce green)*. Developed especially for steelwork, it is recommended for yard cranes, high traveling cranes, drydock cranes, shipways, hammer head cranes, tall land derricks, bridges, towers, water tanks, and so on. Obstructions near aircraft landing areas are required by government regulations to use international orange and white markings.

Low structures and equipment *(#20 medium navy gray)*. Same standard as that for shops and transportation equipment (page 127). To be used on relatively small cranes, locomotive and automotive cranes, winches, etc.

Gasoline and oil tanks *(aluminum)*. Has a fairly high reflectance, and will reduce evaporation losses considerably. In very hot and sunny climates, white reduces evaporation still more.

Smoke stacks *(aluminum)*. Where heat resistance is necessary, use aluminum instead of black, but for high temperatures employ black.

MACHINERY

Brightness rather than pronounced color is the basic factor in finishes for machinery. A neutral body such as gray is superior to a hued one, because it tends to conceal unavoidable chip marks or stains. The use of high-light areas on machinery is optional, though highly desirable. Never use it for decorative purposes. It should be restricted to areas where worker's attention is to be concentrated, not applied to parts where it will prove distracting.

Scheme A *(#20 medium navy gray for body of machine, with working areas painted #22 high-light buff).* Recommended as a standard for machinery under general shop conditions. Used in the majority of cases.

Scheme B *(#19 light navy gray with key working areas painted #22 high-light buff).* Recommended for shops where high standards of maintenance and close tolerances are required, such as instrument, electrical, optical, tool, and diemaking shops.

Scheme C *(#21 deep navy gray with working areas painted #22 high-light buff).* Limited to large heavy machinery such as giant presses and planers, and drop hammers. Keeps such equipment from being too conspicuous, and hides unavoidable lubricant stains.

Scheme D *(#22 high-light buff throughout).* Recommended for machinery where best conditions for good maintenance are required, as in clothing factories.

FURNITURE AND EQUIPMENT

Equipment permanently fixed against walls should be painted in the adjacent dado color, even if it extends above the dado line. Free-standing and movable equipment should be painted #20 medium navy gray or #19 light navy gray as will be described. This plan minimizes painting expense, yet allows transfer of movable equipment without need of repainting.

No. 20 medium navy gray. Preferred for practically all equipment used in shops, including boxes and trays. To be used in conjunction with schemes A and C (for machinery) on benches, tables, racks, bins, shelving, portable scaffolds and so on. Does not distract worker from the job. Applicable chiefly to area conditions coming under principles 1 3, 4, 5. and 6.

No. 19 light navy gray. To be used on equipment in shops painted under principle 2, with machinery painted under scheme B. Also applicable to equipment in administrative and personnel areas and to virtually all facilities painted according to principles 7 to 17.

Other colors. White may be used on the exposed surfaces of back panels of shelving to reflect more light. Aluminum may be specified where conditions require, such as exposure to temperatures under 400 degrees F. Tanks containing chemicals also may require special finishes. For welding booths, use #20 medium navy gray instead of black (to eliminate low visibility) or aluminum (to minimize specular reflections and glare).

TRANSPORTATION and MATERIALS HANDLING EQUIPMENT

Except to the extent modified by the safety code (page 127), three basic colors are recommended:

No. 20 medium navy gray. Use for practically all transportation equipment, such as automobiles, trucks, and trailers, and on relatively large materials handling equipment such as automotive and railway cranes, house cranes, freight cars, dump trucks, and similar vehicles. Add black and yellow striping on front and rear, bumpers, crane tips, etc.

No. 21 deep navy gray. For equipment subjected to excessive amounts of oil or dirt, such as yard locomotives, coal cars, road rollers, and similar road repairing equipment, etc. Add black and yellow striping to all bumpers and footboards.

No. 14 brilliant yellow. Applied on all relatively small equipment that may create hazards, such as platform trucks, fork trucks, lift trucks, transporters, shop mules, small industrial tractors, scooters, dollies, and jacks. Preferable for road repairing equipment, such as scrapers, bulldozers, and snow loaders, and for mobile service and maintenance equipment, where safety rather than appearance is paramount.

HOUSEKEEPING

Neutral tones of gray and white are recommended for promoting good housekeeping.

Aisle marks. Use white stripes for traffic lanes, storage areas, and other floor markings, except around hazardous areas, pits, platform edges, etc., where #14 brilliant yellow is recommended by the safety code.

Waste recepacles. Paint in #19 light navy gray to avoid prominence. A large white star on waste receptacles and white floor areas under them will discourage the accumulation of litter. Use a supplementary color code for special purposes, in the form of a 4-in. band around the edge of lid and rim of can, such as yellow for oily rags and combustible materials. Scrap buckets and containers, to distinguish them from rubbish cans, should be identified with black lettering on white background, and if desired, also by a color band such as #16 bright green.

Miscellaneous items. White corners at stairways are recommended. In spaces where exceptionally high standards of cleanliness are wanted or where dust is objectionable, use a white base about six inches high on walls. Colored drinking fountains, and food, candy, and soft drink dispensers (generally on lease or rental), should be refinished in white if feasible.

STANDARD CODES

All color recommendations in all other categories are subject to whatever modifications are needed to meet accepted color practices set up in the safety code (ASA Z53.1-1945), the piping code (ASA A13-1928), standard colors for gas masks (Safe Practices Pamphlet No. 64, National Safety Council), and other uniform color codes designed for special applications or services.

Safety code colors are indicated in the chart under No. 13 to 17 inclusive.

MILL TRIPS TAKE MYSTERY OUT OF STEEL MAKING FOR ARMCO GIRLS. HERE A GROUP STUDIES FURNACE CONTROLS

Office Girls Learn Steel Making

GIRLS WHO WORK at the Butler, Pa., Division of Armco Steel Corporation know the difference between a tandem bike and a tandem mill. They can tell you why salt is thrown on a slab before it is rolled in the hot mill. Words like "annealing," "ingot," "scarfing," and "yield" aren't a mystery to them.

What these and other steel mill terms mean in steel making were explained at the Butler plant through a mill operations training course designed *for women only.*

Necessary? Armco officials thought so. They reasoned that the girls would do a better job, make fewer mistakes, take more interest in their work if they knew the story of steel making from start to finish.

It was a question that first started this idea.

"What's a tandem mill?" one of the production office girls asked the plant training advisor. "I've typed those words a hundred times, but haven't the faintest idea what they mean."

Information Needed

This started the ball rolling. During the next few days the training advisor visited plant offices, conducting an informal survey. A filing clerk was frank about her lack of understanding.

"I wish someone would explain this new electric melting furnace to me," she said, "or show me what it looks like. I work with production and cost reports on the thing and I've never even seen a picture of it."

"For a long time," a typist complained, "I've been making out tonnage reports on steel processed through the Sendzimir mill. For all I know about a Sendzimir mill, one of those things might live next door to me."

These comments were typical. The girls had a problem—a problem that was right down the training advisor's alley. At the time, there was a training class in full swing, called the Observation Course—for men. It was a primary and semi-technical survey course on steel making. It had been doing a good job at Armco plants for years.

With a little trimming here and there, the training department fashioned a tailor-made course for girls. The result: If a girl wanted to learn about steel or steel making she could do so in eleven easy lessons. The new course was announced on plant bulletin boards and in the manager's weekly news letter to employees. Registrations poured in. The response was so good that two evenings a week had to be scheduled, instead of the one originally planned.

Information Provided

The course combined seven lectures and four mill trips. First came a trip, with guides trained in mill know-how to answer questions and describe the operations. Groups were small—no more than five in each—so that individual attention could be given by the guides. The filing clerk who wanted to see the electric melting furnace not only got a look at it, but she put on dark glasses for a peek inside at the bubbling, molten metal. All down the line, from the slab mill into the hot and cold mills, and through the various processing and finishing departments, this "watch closely" system was followed.

The next week brought a classroom session on the departments that had been visited. At this meeting each girl received a mimeographd booklet explaining the major operations. Blackboard sketches and diagrams were used to supplement the written material. The session lasted two hours, long enough to cover the subject properly and still allow time for a question-and-answer period.

The other plant visits and meetings followed a similar pattern, with the addition of movies at appropriate points. After the last class, it was back to the typewriter and filing cabinet for the girls. But they went back with a better knowledge of their complex company and its business.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

It still looks like you'll get a new labor law this year. (But don't bet on it.)

Completely demoralized were the labor lobbyists and their friends in the House after the favorable vote on the Wood Bill. Now some of them talk about leaving Taft-Hartley on the books until next year.

This is how they reason: ***With elections ahead in the fall, Congress will be more amenable to labor's wishes in 1950. Therefore, it will give labor a better break. "So wait a year and get a better deal."***

Wiser heads don't agree. They know a bird in the hand is worth two in the bush. They'll push for some action on Taft-Hartley. *Now.*

You're beginning to see more agreement around Washington on what the new law should contain. You find it in the Taft amendments, in the Sims Bill, in labor's concessions.

Take the injunction in national emergency disputes. Taft wants it. So does Truman's bill as amended by Representative Sims.

And government seizure. Taft offers it as an alternative weapon to the injunction. (This was really Ives's idea.) The labor leaders want it, too. (You might get it.)

Take non-Communist affidavits for union officials and employers alike. All sides agree on this now.

Free speech is another. Also: Putting NLRB counsel Robert N. Denham's office back under control of the board.

Other points of agreement: Financial reports and compulsory bargaining by unions; easing restrictions on closed shop, welfare funds; keeping curbs on jurisdictional disputes and some secondary boycotts.

You can assume this much: All or most of these provisions will be in any new law. Taft-Hartley won't disappear completely.

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What's happening on minimum wage shows the poor state of organized labor's program in Congress. Democratic leaders have given up trying to bring several million more workers under the law. They're trying now just to get the minimum raised to 75 cents an hour.

Congress won't pass a 75-cent floor. There's a chance it might go to 60 or 65 cents (from the present 40 cents an hour).

Do you deal with one of CIO's dozen commie-line unions? Unless your local is in strong right-wing hands, you may be headed for trouble.

Philip Murray finally got fed up with the knifing and smear tactics of the Communist clique in CIO. He's laid down the law: ***Back up CIO policies; or get off the executive board.***

The finger points to Harry Bridges, Julius Emspak, Grant Oakes, Donald Henderson, others. They won't quit the executive board. Nor will they pull out of CIO. In that case, Murray wants rank-and-file members to kick them out of office.

This is no easy job. In only one left-wing union is there any threat against the top boss. That's the biggest one: United Electrical Workers. The right-wingers have got to win in this union to break the back of the Communist resistance in CIO.

That's why a real push is on to put over a right-wing slate at UE's Cleveland convention in September. But it won't go over. Not this year.

Here's the tip-off: Former UE President James B. Carey isn't running for his old job.

●

In other unions—smelter, food, office, farm equipment, longshore, fur—there's little, if any, right-wing opposition to the left-wing leaders.

Look for a big blow-up next October. (That's when CIO meets in Cleveland.)

What does this mean in your plant? Simply that union factionalism will complicate the issues in any dispute. You may find more of them political than economic. There's some of it in the Ford situation.

CIO's crackdown on Communists opened the door to joint action with AFL in international labor politics. You remember how AFL refused to join WFTU in 1945. It didn't want to work with Communists. Now CIO has quit WFTU. So the two are cooperating in starting a new, non-Communist international group.

AFL got this promise from CIO: It won't challenge AFL's status as American labor delegate to ILO.

We have AFL-CIO collaboration on the domestic front, too. You see it most around Congress, in the corridors of state capitols, in cities and towns. Yet AFL-CIO organic unity is a dying issue. More real: Chance of John L. Lewis playing with the Communists.

UAW-CIO's strike against alleged "speed-up" at Ford gummed up fourth-round wage bargaining strategy. Communists forced it against Reuther's wishes.

Here's a tip: Keep your eyes on Murray and Lewis. They're likely to set the wage patterns.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Business in general has the momentum to carry on in high well into the summer.

Retail trade is holding up well. Department store sales, for example, have been running three per cent under last year in dollar volume—but with lower prices that actually means unit sales are running ahead. Housing starts, running slightly behind 1948, but well ahead of 1947, point to another very good year for homebuilding. Construction as a whole, bolstered by an increase in public works, promises to top last year in physical volume.

Production has been easing off steadily. Businesses living off inventories—filling orders from the shelf, but not filling the shelves by reordering—have contributed importantly to cutbacks in production. Strikes, too, have helped hold down production indexes. The auto industry, for example, hoped to top 1929's output record in the second quarter—but strikes at Ford, Bendix, and smaller plants killed the chance. With it all, the Federal Reserve Index of Production will probably average under 180 for April-May-June. But unless jitters over the business outlook develop into a real setback—which seems unlikely with consumer incomes and consumer buying running at high levels—new orders should hold production on a high level through the summer.

●

Looking ahead, though, business sees the need for real selling.

"Selling" will soon mean much more than merchandising. It will mean that business must turn out more attractive products, more attractively priced. Three key industries—automobiles, housing, and steel—show the reason why.

The auto industry is in a competitive market. Gray markets and black markets are gone. The spring upsurge in buying, marking the opening of the summer driving season, marked the turn. But prices of used cars, which usually share the spring uplift, are sliding and continuing to slide. *By fall, Detroit will feel the need for major adjustments in selling and pricing to maintain high production and high employment.*

Behind the competitive market is the fact that the U. S. now has a "normal" number of cars on the road—about as many cars as experts expect on the basis of prosperity and the long upward trend in auto usage. But the industry still has a "backlog." There are 12,000,000 jaloppies more than 10 years old on the road. In 1941 there were only 4,000,000 that old and still going.

If it can persuade the owners of those veterans to turn them in for "younger" used cars, and the owners of post-war cars to trade them for new cars, Detroit can keep going at close to today's production rates for another three years.

That's a marketing problem. Owners of 10-year-old cars may not be able to pay today's prices for, say, 3-year-old cars. And the man with a 1946 model may not be able to afford a new car—on which the price tag is some $300 more than it was last year. Clearly, the industry needs to stimulate owners of '46 and '47 cars to buy new cars—and owners of 7- to 10-year-old cars to buy post-war cars. That, indirectly, will bring about replacement of the very old cars. But it may take some healthy price reductions to do it.

The housing industry, having built 2.7 million permanent homes in the last four years, and expecting to start between 850,000 and 900,000 this year, will have pretty well washed out its wartime shortage by December. The statistics show that by then there'll be homes enough to take care of all those who had to get in out of the rain, and those who have been doubled-up with other families. With the desperate shortage gone, homebuilders might expect their volume to fall off next year.

The demand for houses under $8,000, however, is still a long way from being filled. It's too early yet to size up prospects for homebuilding next year. But clearly builders will face a challenge: to find ways to put out attractive houses at still more attractive prices.

The steel industry's operating rate reflects some falling off in demand now. It's down 5 per cent or so from the January and February peak. With an easing in auto production and in homebuilding will come more easing in steel.

●

As the last of these great shortages go, industry will have a major test of its ability to make the adjustments necessary to avoid a real recession.

The fact that other businesses have met their post-war buyers' markets one by one has been good luck. First the jewelry, fur, and night club businesses ran into buyers' markets, right after the war. Then cotton textiles were hit. Others joined the parade. With shortages widespread, and business in general hitting new peaks regularly, it was easy to make those adjustments. But now it looks as if three key industries—autos, homebuilding, and steel—are about to run out of their backlogs, and at about the same time.

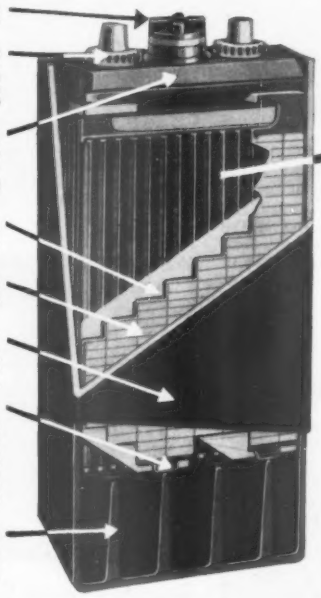
Labor will have a key role to play. If strikes are prolonged this summer, or sharp wage increases put a crimp in industry's ability to adjust prices, unemployment may be the result.

But if management and labor make reasonable settlements—and go to work to sell—1950 can be another fine year for business.

EXIDE-IRONCLAD BATTERIES ARE DIFFERENT!

They are specially designed to provide years of dependable service in all MOTIVE POWER WORK

Storage batteries are called upon to perform many tasks. No single type of battery is adequately suited to all. To meet these numerous requirements, Exide engineers have developed special types, to fit each application.* Among these several types is the specially designed Exide-Ironclad Battery. Details shown below.


VENT PLUG specially designed to prevent escape of electrolyte.
GREASE SEAL RING NUT holds battery elements securely in place . . . prevents creepage of electrolyte . . . keeps tops clean and dry.
SEALED CELL COVER flush with top of jar. Prevents collection of dirt or moisture . . . keeps impurities out of cell . . . eliminates leakage of electrolyte.
SEPARATOR of high porosity, specially treated to last the life of the battery.
NEGATIVE PLATE made extra heavy and built to match the long life of the positive plate.
JAR made of specially tough and durable Giant Compound. Built to withstand the jolts and jars of hard industrial usage.
FEET. Internal short circuits practically eliminated because the two feet on negative plate rest on different ribs from those of the positive plate, and because separators extend below both plates and rest on all four ribs.
RIBS support all plates and separators. Their height provides generous sediment space so that internal cleaning is unnecessary.

DIFFERENT IN DESIGN

DIFFERENT IN CONSTRUCTION

DIFFERENT IN SERVICE QUALITIES

Chief among these differences is the unique positive plate, an exclusive Exide feature.

EXIDE-IRONCLAD POSITIVE PLATE

Consists of a series of finely-slotted tubes which contain the active material. So small are these slots that, while permitting easy access of electrolyte, they retard the active material from readily washing out or jarring loose . . . adding considerably to life of plate.

Exide-Ironclad Batteries have ALL FOUR of the characteristics that a storage battery must have to assure maximum performance from battery electric industrial trucks — high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of dependable day-in, day-out service.

DEPENDABLE POWER

"Exide" and "Exide-Ironclad" *Reg. Trade-marks U. S. Pat. Off.*

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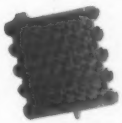

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The Exide-Manchex Battery has the manchester type positive plate with the lead button construction. Specially designed for stationary use in many classes of industry.

DESIGNED FOR AUTOMOBILE USE

The Exide Automobile Battery has plates of staggered grid construction. Specially designed for use in automobiles, trucks, buses, aircraft and numerous other applications.

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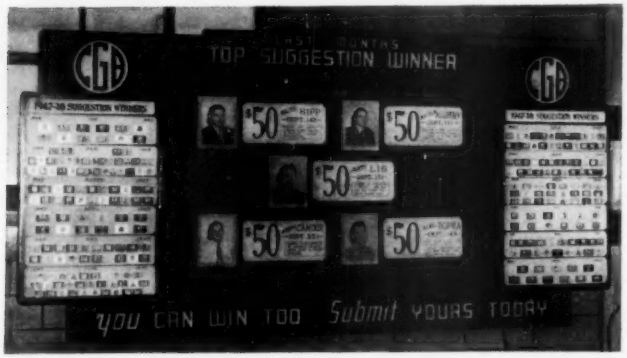
OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for



PICTURES OF THE TOP SUGGESTION WINNERS are posted each month in the center section of this novel suggestion award board at the Cleveland plant of Cleveland Graphite Bronze Company. An accompanying placard tells the name of the winner, his department, amount of award, and gives a short description of the winning suggestion. At the end of the month small duplicate photos are placed on a side panel with other award winners for the year and pictures of the new month's winners are posted in the center. The board has stimulated interest in the suggestion system.

Merry-Go-Round Conveyor Aids Final Inspection

A continuous merry-go-round conveyor in the final inspection department at Friden Calculating Machine's San Leandro, Calif., plant has a separate moving platform for each machine. Girls on the outside take machines off the conveyor to run test problems. If machine is not functioning properly it is replaced on the conveyor facing in for the "final correctionists" seated in the inner circle. Four workers in the foreground put covers on machines tagged to indicate perfect working condition. Machines then move to farthest table for more testing and adjustment. Finished calculator is taken from conveyor, boxed, and sent to shipping room on low conveyor running through wall in center background.

Plant and Office Workers Study Each Other's Jobs

Plant and office personnel at Refined Syrups & Sugars, Inc., Yonkers, N. Y., have interchanged visits to develop a better appreciation of each other's job. Moreover, an understanding has grown of the way in which all the tasks at the refinery relate, directly or indirectly, to every task.

The company recently conducted a six-week program whereby foremen and supervisors from the plant visited the office in groups of four. Each group spent an entire week observing departmental operations. They sat in at officers' meetings and lunched with executives.

Simultaneously, groups of office workers toured the plant to observe first-hand the actual manufacturing process and refinery operation.

•

Dispatch Board Expedites Material Delivery

Dispatch board, conveniently located on plant columns, expedites the delivery of materials between departments and buildings at the Allis-Chalmers Manufacturing Company, Springfield, Illinois. When a load is to be delivered out of a particular department, multiple copies of the delivery ticket are made. The original copy is placed on the load and one of the duplicates is placed on the dispatch board in the pocket number of the department to which it is to be delivered. The trucker picks this ticket up from the dispatch board and then matches it up with the

*SINCE 1939

While other high costs are "leveling off"

Here's one you can cut to INSIGNIFICANCE

NOW!

You don't have to wait for *favorable* market conditions to cut industrial eye accident costs. *The costs of eye accidents are always high—but the cost of the protection that prevents *98% of the injuries is always infinitesimal in comparison.*

Typical Case: A machinery manufacturer saved $42,000 in annual eye accident costs after installing an AO eye protection program. A check of your own eye injury costs and similar positive action can assure important savings for you. Ask your nearest AO Safety Products Representative for complete details.

**According to the Society for the Prevention of Blindness 98% of industrial eye accidents are prevented when shop workers wear safety goggles.*

American Optical COMPANY *Safety Products Division*

Southbridge, Massachusetts
Branches in Principal Cities

ticket on the load to be delivered. As a result, truckers no longer have to get off their trucks and check with the material clerk. Deliveries are being made faster and work is easier. With one look at the board, foremen can tell the amount of work that is piled up and can expedite it.

Display Boards Show Product to Employees

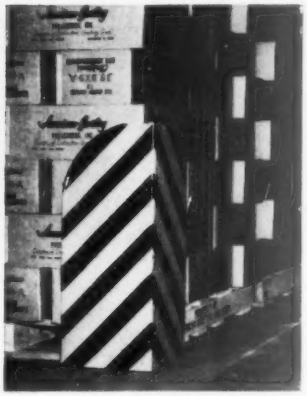
To show where parts that employees make, fit into the finished product, special product display boards have been put up in the air cleaner and silencer department at AC Spark Plug Division, Flint.

The boards show a cutaway air cleaner or silencer and a blown-up picture of the product. Lines are extended from each part of the cutaway model and picture to a chart on the board which tells the name of the part and its use in the completed product.

Through the use of these display boards, it is possible to point out important inspection points on the product. These display boards enable employees to become better acquainted with the product and help to maintain quality control as employees are able to check on their work as they go along.

•

MIRRORS AT T-AISLES are arranged to make traffic visible in all directions at the plants of the Borroughs Adding Machine Company, Detroit. This type of mirror arrangement reduces the hazard at busy intersections in the plants

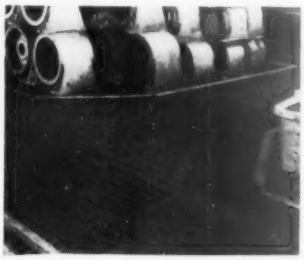


METAL CORNER PROTECTORS are used in the Cleveland plants of American Greeting Publishers, Inc. to prevent damage to the corners of cartons piled along the aisles. The corner protector has a triangular metal base which slides under the pallet and holds the corner firm. Cartons near the aisles no longer get banged up by inter-plant trucks.

•

Nameplate Helps Everyone Get Better Acquainted

Bronze nameplates are issued to each of the workers at Woodward Governor Co., Rockford, Ill. The nameplate is displayed on the worker's desk, bench, toolbox, or at some other prominent position in his work area. It serves to identify the worker and his work area. It encourages good housekeeping on the job and a feeling in the worker that his work is important. It builds up his confidence, pride, and self-respect. This practice also helps fellow employees to become acquainted rapidly. Management at Woodward feels the nameplate personalizes the job and helps create pride in job and company.



Raised Aisle Markers Protect Storage Areas

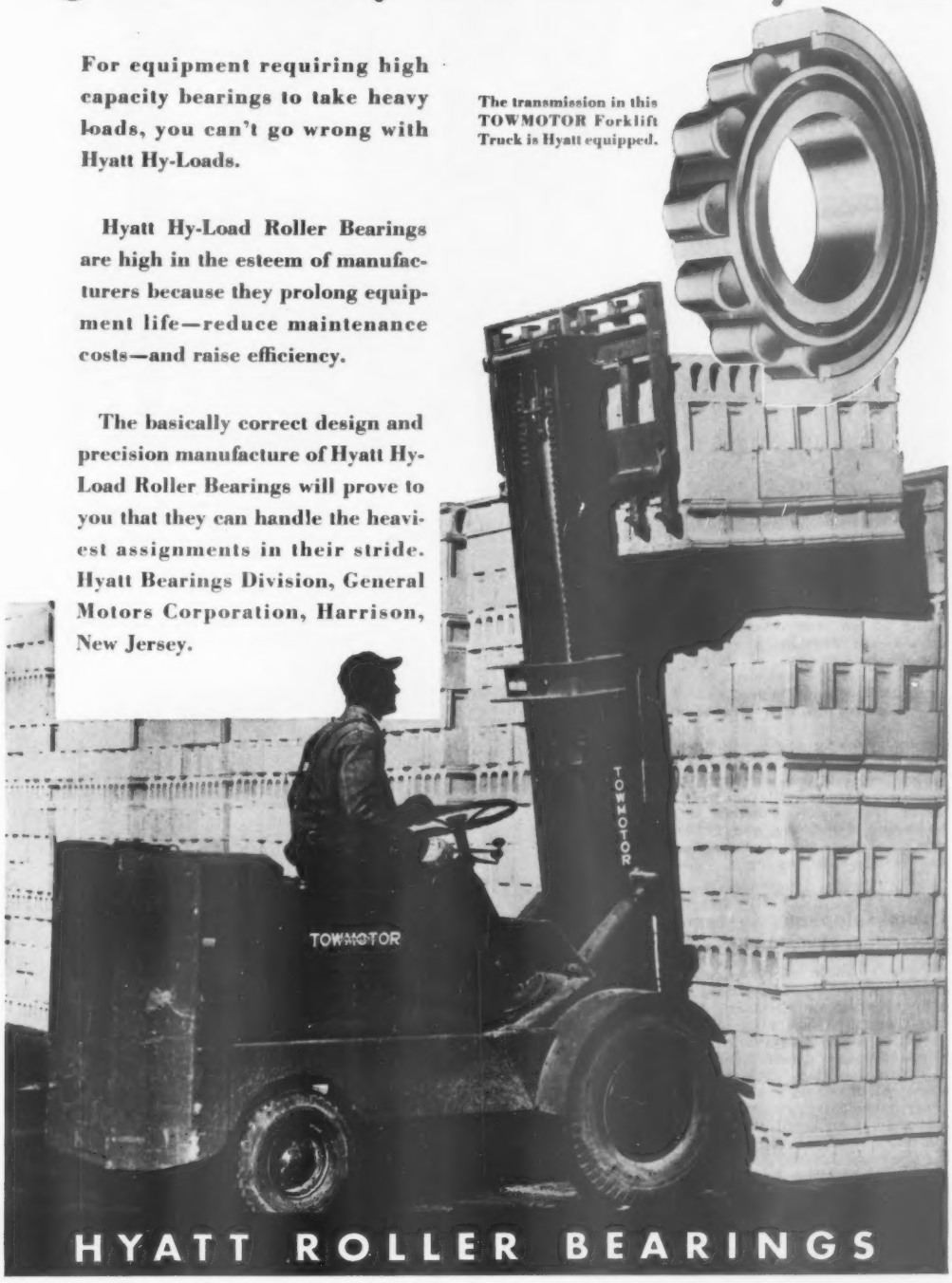
Raised aisleway markers, painted yellow, outline all the aisles and

Higher Efficiency with HYATT Hy-Loads

For equipment requiring high capacity bearings to take heavy loads, you can't go wrong with Hyatt Hy-Loads.

Hyatt Hy-Load Roller Bearings are high in the esteem of manufacturers because they prolong equipment life—reduce maintenance costs—and raise efficiency.

The basically correct design and precision manufacture of Hyatt Hy-Load Roller Bearings will prove to you that they can handle the heaviest assignments in their stride. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



The transmission in this TOWMOTOR Forklift Truck is Hyatt equipped.

HYATT ROLLER BEARINGS

protect parts in storage in the shops at the Falk Corporation, Milwaukee. A shop rule demands that all machinery, tools, equipment, and stock be kept behind the markers. Markers are raised about one inch and have tapered sides. The system has proved itself to be a safety aid, as well as providing convenient and uninterrupted passage for moving shop trucks and equipment.

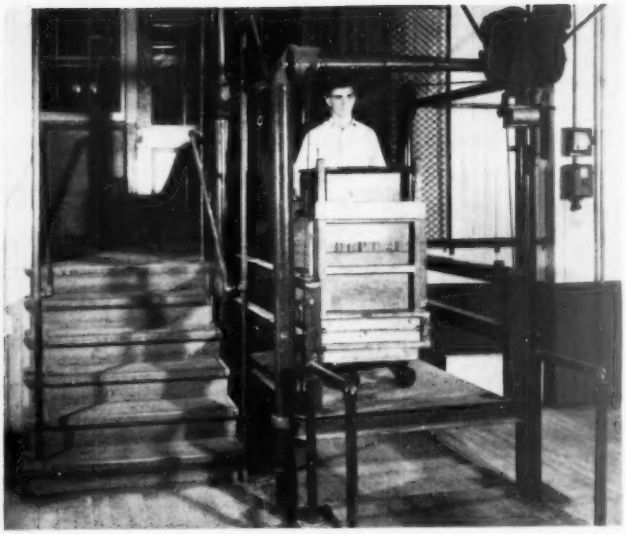
•

SHEET STEEL HOIST with a capacity of ten tons attached to the main 25-ton crane has greatly simplified the problem of handling sheets at the Ivanhoe plant of the Perfection Stove Company, Cleveland. The jaws, capable of handling sheet up to 76 by 120 inches, slip under the load by a simple adjustment made from the floor. The leverage system is such that the arms are pressed inward, effecting a locking action that makes handling safe. Unloading of flat cars, storage, and moving of sheet stock to the presses has been speeded up 50 per cent.

•

Radio-Telephone System Aids Materials Handling

Two-way radio telephones speed movement of materials within the Schenectady plant of General Electric Company. Six diesel-electric switching locomotives, which move about 3600 cars a month, are now in constant contact with the yard office. All messages are carried on every loudspeaker, resulting in better understanding of the over-all switching operation and eliminating the possibility of cutting in on conversations. The foreman, who formerly was required to carry orders to locomotive crews in his car, is now free for trouble-shooting, and delay in transmission of orders is avoided.



SERVICE LEVELERS simplify the inter-floor transport of materials handling trucks at Sangamo Electric Company, Springfield, Ill. Floor heights in sections of the factory vary and previously workers had to push trucks up and down ramps. Since the load on the trucks is approximately 500 lbs. gross, and the lift is 33 inches, two or three men were required to handle this 1375-ft.lb. job each trip—eight or ten times a day. In addition, the old ramps took up about 45 square feet of floor space.

The new levelers require approximately 30 square feet of floor space, and one man can handle the job. The result: less floor space is required, labor time is saved, no heavy pushing is needed, and accidents are minimized.

"Can We Make It?" Asks Bulletin Board

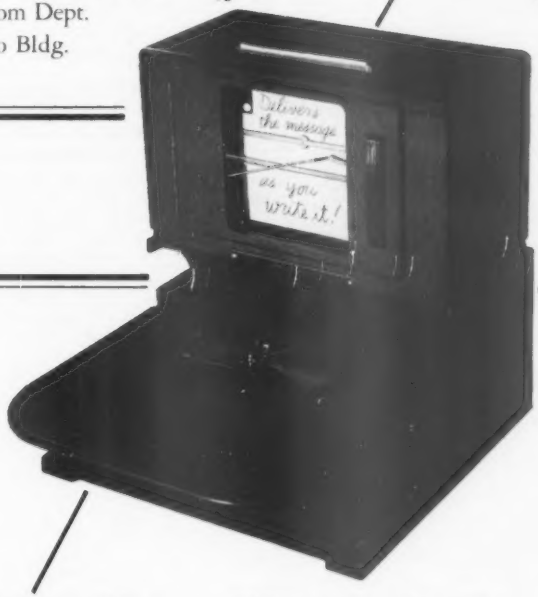
A bulletin board located in the manufacturing-engineering department, encourages engineer and production men at Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Mich., to think how parts bought on the outside can be made in the plant.

Management had found that many purchased parts could be made more efficiently in the home plant. Therefore a bulletin board was designed with this slogan: "We are Now Buying This Part—Can We Make It?" Under the slogan is a sample of the part in question, together with a blueprint. Also noted is the number of parts needed daily.

Engineers, designers, and production supervisors must pass this board frequently during the day. It reminds them to think about how the part could be made at home, thus using more efficiently plant facilities and equipment.

How Efficient Is *Your* Intra-Plant Communication?

"Tops" in Efficiency, TelAutograph Telescribers Send Handwritten Messages Via Wire *Instantly* to One or More Points . . . from Dept. to Dept. or Bldg. to Bldg.



This Efficiency Expert is equally at home smoothing out...

Materials Handling problems
Parts Requisitioning details
Maintenance requirements
Production control difficulties

A message written on TelAutograph Telescribers is immediately reproduced in writing (on another instrument) at the location—or locations—you wish to contact.

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"Handwritten Messages Deliver Themselves... While You Write."

management data sheet 46

Closed Shop *vs* Union Shop *vs* Dues Shop

The Shops— Their Differences Are Important

If you are an employer, if you run a union, if you are a worker, these facts will help you make up your mind about Taft-Hartley and the shops.

•

Closed Shop

If you are an employer, you are limited in your right to decide who will work for you or for how long.

If you run a union, you have the right to decide who will work for whom and for how long.

If you are a worker, you are limited in your right to decide for whom you will work or for how long.

All this is because in a *closed shop* the worker must be admitted to the union before he can be employed and must be fired by his employer if the union decides he is no longer in good standing in the union.

•

Union Shop

If you are an employer, you can decide who will work for you but you are limited in your right to decide for how long.

If you run a union, you cannot decide who may work, or for whom, but you can decide for how long.

If you are a worker, you are not limited in your choice of whom you will work for but you are limited in your choice as to how long.

All this is because in a *union shop* the worker need not be admitted to the union before he is employed, but he must join shortly after employment and his employer must fire him whenever the union decides he is no longer in good standing with the union.

Dues Shop

If you are an employer, you can decide who will work for you and how long.

If you run a union, you cannot decide who may work, or for whom, or for how long.

If you are a worker, you can agree for whom you will work and if, after you are employed you pay an initiation fee and regular dues to the union, you will not be fired on the demand of the union even though the union decides you are in bad standing.

All this is because in a *dues shop* the worker does not have to be admitted to the union before he can get a job and will not be fired on the demand of the union except for failure to keep his dues paid. He can decide for whom he will work and for how long; but he cannot decide to take a free ride on the union which bargains with his employer for his wages, hours, and working conditions.

The employer who wants the *dues shop* wants the right to pick his employees and keep them so long as the jobs last; but he accepts the union as their bargaining agent and agrees that the union should collect an initiation fee and dues from all his employees.

Of the three the *dues shop* is the only legal shop since 1947, when the Taft-Hartley Act was passed by Congress.

The *employer* who thinks there is little, if any, difference between the *closed shop*, *union shop*, and *dues shop* and *opposes all of them probably has not accepted unionism.*

The *union* which opposes the *dues shop* and demands a *closed shop* or *union shop* wants something more than the right to bargain for wages, hours, and working conditions and *probably has not accepted management.*

This statement deals with contractual union security provisions only and not with other factors of employment, such as seniority, promotions, lay-offs, discharges for inefficiency or misconduct, etc.

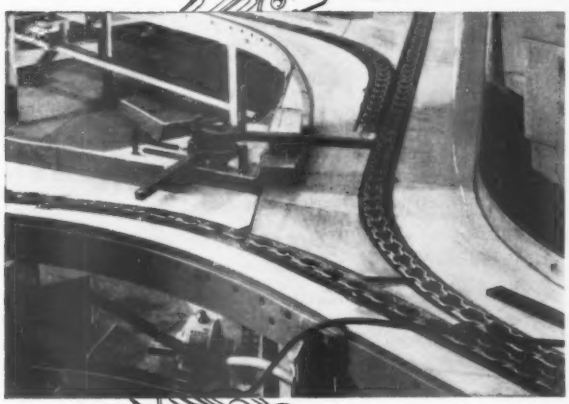
SOURCE: Pittsburgh Plate Glass Company, Pittsburgh—"A Message from the President"

flexibility *that saves floor space!*

• Rex Double-Flex Chains help you make the most effective use of your floor space . . . simplify conveyor set-ups. Their unique ability to flex in two planes enables them to make horizontal turns, thus making it possible to weave around beams and other obstructions.

These space-saving chains provide an ideal means for carrying cartons, boxes, large cans, packages and parts into and away from plant unloading or delivery points. They are also effectively used in packing lines and assembly tables.

Rex Double-Flex Chains are made of Rex Z-Metal for maximum resistance to corrosion and abrasive sliding wear. Links have added wearing surfaces on sliding edges. Rex Double-Flex will outlast any similar type chain. For all the facts, call your local Rex Field Office or write Chain Belt Company, 1667 West Bruce Street, Milwaukee 4, Wis.



• *Rex Double-Flex Chains can be turned to converge at one delivery point to considerably simplify handling problems and step up efficiency.*

• *The ability of Rex Double-Flex to weave around obstructions simplifies conveyor set-ups . . . makes most effective use of floor space.*

CHAIN BELT REX COMPANY . . . DRIVE AND CONVEYOR CHAINS

WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market

Hour Recorder

Designed to record the number of hours any piece of equipment with moving parts has been operated, the Reliance Hourmaster converts revolutions per minute, from one to 4000, into hours of operation. Record cards which slip into a frame on the front of the housing can be used to accumulate service, production, or maintenance data. Each instrument records up to 100,000 hours of operation. Barbour Stockwell Co., 205 Broadway, Cambridge 39, Mass.

Pipe Flange Spreader

Designated Model OTC No. 1001-D, pipe flange spreader consists of a set of two tools which, when used on opposite sides of the flange joint, exert a steady pressure on the flanges. This is said to eliminate breakage and to make a quicker and safer job of spreading the flanges to replace gaskets. Owatonna Tool Co., 363 Cedar St., Owatonna, Minn.

•

Annunciator

Intended for heavy-duty operation, "Anfa" annunciator may be incorporated in new or existing control panels, actuator boards, or instrument panels. Its function is to indicate the occurrence, continuance, or termination of any event that is physically perceptible. It may be used with a remote thermostat or thermocouple, a diaphragm switch, or with any switch which will close when physical movement occurs. Device will indicate opening or closing of doors, valves, or gates, and may be used in conjunction with a photoelectric cell or connected to float or flow switches. Illuminated 2x4½-in. windows may be read from as far away as 30 feet, according to the manufacturer. Built with three switches: one to illuminate all lamps as a test for burned-out bulbs, another to silence the warning bell or horn, the third to reset relay control and extinguish any lamps which remain lighted after the remote contacts have opened. The Autocall Co., Shelby, Ohio.

•

Roller Chain Repair Set

Tool for use in roller chain repair, consisting of anvil, fork, and punch, is said to eliminate binding in disassembling. In use, the prongs of the fork are inserted between the sideplates of the chain so as to span the two rollers containing the pins to be removed. Fork and chain are then laid in the slot of the anvil, which is milled to the contours of the chain to prevent slippage. In this position, the pins can be removed by striking each one alternately until driven through the links. Available in sizes to fit any standard roller chain. Atlas Chain & Mfg. Co., Castor & Kensington Aves., Philadelphia 24.

•

Roll Handler

Attachment for manufacturer's Skylift electric fork trucks will handle paper rolls varying in diameter from 24 to 48 inches, and up to 60 inches long. Manufacturer claims that if properly balanced, rolls can be as much as 78 inches long. Device consists of a motorized unit that revolves through 360 degrees, two hydraulic clamping devices, and adjustable contour-lip clamping arms. Arms are pushbutton-controlled, equalize themselves independently for positioning in accordance with the diameter of the roll, making it possible to pick up two rolls of different diameters simultaneously. Automatic Transportation Co., 149 W. 87th St., Chicago.

Special Metal Punches

Two manually operated punches are designed to lighten the load and speed the work of sheet metal men. The dovetail notcher, No. 121, is intended for use when installing collars, stubs, and Y-joints. It will notch clean dovetails in mild steel up to 20 gage, and fold tabs down square in one motion. Spring-return jaws release quickly for successive cuts. The snap-lock punch, No. 131, pro-

CENTRIFUGAL

(LEFT)
Motor-driven R-C Centrifugal Blower, 24" type OIB, capacity 19,600 CFM.

ROTARY

(RIGHT)
Type RCD Rotary Positive Blower, used for conveying. Capacity 1,500 CFM.

R-C dual-ability GIVES YOU *straight* ANSWERS

Centrifugal or Rotary Positive? Which type of air or gas handling equipment is best suited to your needs? The answer depends upon the specific job—and you'll get the cold, unbiased facts from R-C *dual-ability*.

We can give you this *dual choice* because we build both—and we are the only blower manufacturers who do so. Further, our range of sizes, capacities, pressures and other characteristics is so wide that we can usually match or very closely approximate even exacting specifications.

By such fitting of equipment to the requirements of the job, you get superior performance, dependability and long life from your R-C units—the natural result of 95 years of blower-building experience.

ROOTS-CONNERSVILLE BLOWER CORPORATION
906 Central Avenue, Connersville, Indiana

FOR HANDLING GAS OR AIR, CALL ON *R-C dual-ability*

Roots-Connersville builds the most extensive line of gas or air handling equipment.

Centrifugal and Rotary Positive Blowers, Exhausters, Boosters

•

Rotary Liquid and Vacuum Pumps

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Inert Gas Generators

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Send for descriptive bulletins or write us details of your specific requirements.

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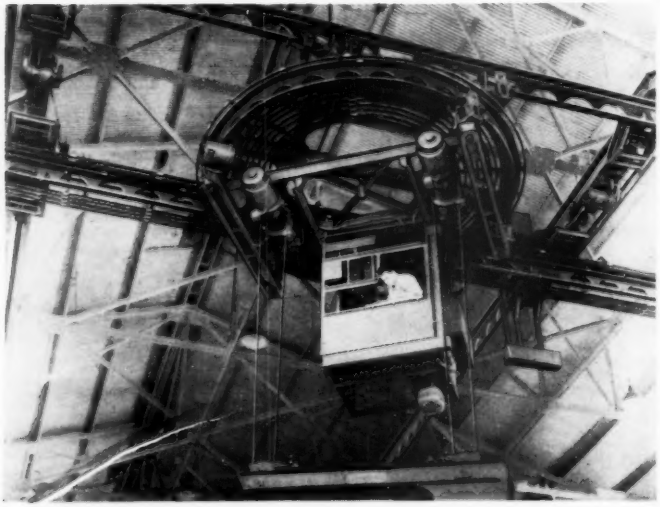
BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ **ONE OF THE DRESSER INDUSTRIES** ★ ★

Side-Dump Truck

A 3-ton wastebasket that rolls on a spring-mounted chassis is hinged at the bottom to permit lowering of the side for dumping. "Trash-Truk" is available with various styles of chassis and running gear. Outside dimensions are 10x4 feet; depth, 42 inches; capacity, 6000 pounds. Pressed-on 18x5-in. rubber-tired wheels. Service Caster & Truck Corp., Albion, Mich.



Rotating Hairpin Hook Carrier

Designed to pick up coils of rod or wire, transport them, and turn the load as much as 90 degrees when placing it, rotating carrier operates on a circular track built into an overhead crane trolley. The hairpin-type hook on which the coils are carried may be turned clockwise or counterclockwise, tilted up or down when threading into or drawing away from coils, as it is carried on two separate hoists. All motions of the equipment are controlled from the crane cab, which is open, with landing platform and a floor of glass and grating. Speeds are: bridge, 400 f.p.m.; trolley, 200 f.p.m.; hoist, 50 to 80 f.p.m.; rotation, 75 f.p.m. Unit illustrated has capacity of 3500 pounds; can be furnished for other capacities, speeds, purposes. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co., Wickliffe, O.

duces uniform ears which, according to the manufacturer, snap under and lock firmly on the seamed edge of a joining piece. When used in fabricating duct and furnace work, punching of ears in sheets, which often requires special dies and heavy presses, can be largely eliminated. This tool is also useful in repairing old installations, as ears can be punched in place on existing work. Tools are 8½ inches long, weigh one pound. Whitney Metal Tool Co., Rockford, Ill.

•

Circuit Breaker

Line of Type DB 600-volt a.c. or 250-volt d.c. circuit breakers features accurate tripping characteristics for low-voltage power distribution, according to manufacturer. Control for long time delay with protection from tampering is provided by a time-delay element assembled in a sealed tube. Available for overcurrent protection, with delayed or instantaneous tripping for use on motors and for general purposes, or for protection with both long and short delay for proper coordination in selective protection on fault currents. Type DB-15 has an interrupting rating of 15,000 amperes with load current ratings up to 225 amperes at 600 volts a.c. or 250 volts d.c. The DB-25 is rated for load currents up to 600 amperes, with an interrupting capacity of 25,000 amperes. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

•

Tool for Bearing Replacement

Designed to remove worn sleeve bearings from motor endplates and insert new ones in one operation, tool accommodates precision-bored bearings on one end, unbored bearings (for undersize shafts) on the other. A central shoulder separates the two. In use, new bearing is slipped into

7 Years ...NO REPAIRS!

SS Unit Pump on 24 hour, intermittent 7 day duty in power plant gives equivalent of 20 years normal service with *no* repair cost, *no* lost time

SINCE EARLY 1942 this SS Unit pump has been on continuous duty in a large mid-west plant. Never once in all this time has it failed to operate perfectly. Outside of normal repacking, not one cent has been spent on repair.

Here's *proof* that the extra-strong design, extra-heavy construction and extra-quality manufacture of Allis-Chalmers pumps give you dependable performance and low pumping costs.

Compare SS Unit features with any similar pump. Notice how SS Unit is compact, yet open for easy maintenance. Motor and pump are solidly bolted together using the same shaft. This design holds alignment rigidly . . . reduces vibration . . . cuts wear and tear. Every A-C pump is tested at the factory. Full rated efficiency and output are *guaranteed*.

SS Unit is one of many Allis-Chalmers pumps for industrial service. For complete information, see your Allis-Chalmers Authorized Dealer or Sales Office, or write for Bulletin 52B6059E. Also in Sweet's.

SS Unit, Texrope and Vari-Pitch are Allis-Chalmers trademarks A-2660

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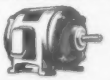


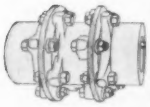
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

THOMAS
Flexible ALL METAL
COUPLINGS

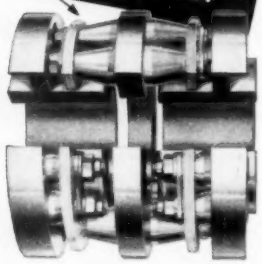
Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.



The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated NO LUBRICATION REQUIRED!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

Write for New Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

the tool with unchamfered end against the shoulder. A spacer, furnished with the tool, is slipped on with its unchamfered end against the new bearing. End of tool is then inserted in the old bearing, from the inner side of the endplate, with new bearing positioned so that its oil wick hole lines up with the hole in the old bearing. With a press or a rawhide mallet, tool is driven until its shoulder seats against the endplate. The spacer forces out the old bearing, and the new one, as it is pushed into position, forces out the spacer. Tool is available in four sizes, for motors with finished bearing sizes of 0.655, 0.751, 0.812, and 1.062 inches. Wagner Electric Corp., 6489 Plymouth Ave., St. Louis 14.

•

Aluminum Roller Conveyor

Made from high-tensile aluminum with steel ball bearings, portable roller conveyor is available with channel frames having a capacity of 50 pounds per lineal foot when supported at 10-ft. centers. Its light weight makes it suitable for portable use in warehouse areas, on shipping platforms. Standard Conveyor Co., N. St. Paul 9, Minn.

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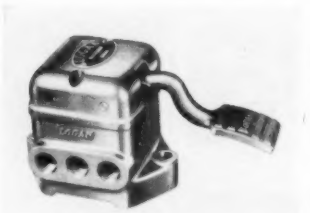

Four-Way Control Valve

Foot-operated 4-way control valve, Model 6552, is built in $\frac{3}{8}$-, $\frac{3}{4}$-, and 1-in. port sizes, for pressures up to 150 p.s.i. Its compact design permits installation in limited space, according to maker, who states that valve cover may be rotated 90 or 180 degrees to simplify piping problems, and that self-cleaning construction keeps cups free of dirt. By taking off the cover, valve piston can be removed; to replace cup packing it is not necessary to remove air lines or disturb the pipe connections. The Logansport Machine Co., Inc., Logansport, Ind.

•

Gas Cylinder Trucks

Intended for welding service, "Samco" cylinder carriers are 40 inches high, 20 inches long, $13\frac{3}{4}$ inches wide. Tanks are arranged in tandem on the trucks to conserve space, and lock bar holds the cylinders in place without shifting. Equipped with either 8x1-in. clincher-type solid rubber tires or 10x1.75-in. semi-pneumatic rubber tires, mounted on heavy-gage double steel disk spot-welded wheels and $\frac{1}{2}$-in. ball bearings. Syracuse Alloy Metals Corp., 116 S. Salina St., Syracuse 2.

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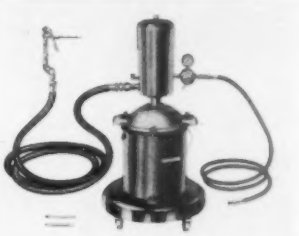

Pump

Portable heavy-duty air-operated pump, called Powerflo, handles gun-grade calking compounds, gun-grade putty, semi-fluid adhesives, sealers, and similar materials. It is intended for use in pumping fluids and semi-fluids from original containers, and is equipped with a 15-ft. $\frac{3}{4}$-in.-I.D. material hose, a flow gun with three interchangeable nozzles, a 25-ft. air supply hose with airline coupler and air pressure regulator and gage. Pressure ratio of $4\frac{1}{2}$ to 1 and double-acting piston are said to provide continuous flow. Gray Co., Inc., Graco Sq., Minneapolis 13.

•

Pneumatic Drill

Small-size $\frac{1}{4}$-in. capacity drill, called the Master Power M-900, is available in free speeds of 1200, 2400, and 4800 rpm. for use in drilling all materials, including metals. Tool weighs two pounds, is $6\frac{3}{8}$ inches long, chuck included. Pistol grip handle and motor housing are of heat-treated aluminum-alloy, with oil reservoir inside the handle. Button-type throttle permits control of drill bit speed. Master Pneumatic Tool Co., Inc., Orwell, Ohio.

•

Voltage Regulator

Small automatic voltage regulator, Model EM4102, rated at 2 kva. output, is electromechanical in operation. It consists of a variable transformer controlled by an electronic detector. Available either as a cabinet-contained or rack-mounting unit, the latter fits standard 19-in. rack panels; cabinet model may be converted to rack mounting if desired. Unit measures 20 $9/16$x$10\frac{3}{4}$x$9\frac{3}{4}$ inches. Front panel carries a

GRINDING WHEELS

GRINDING MACHINES

REFRACTORIES

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NON-SLIP FLOORS

LABELING MACHINES

ABRASIVE PAPER AND CLOTH · · · SHARPENING STONES

AVAILABLE FROM NORTON . . .

the Most Complete Abrasive Service in the World

VARIETY—abrasives for polishing, tumbling and lapping, grinding wheels, segments, bricks and sticks, coated abrasives* and sharpening stones* to meet *all* demands of industry.

DISTRIBUTION—grinding wheel distributor stocks in over 300 cities throughout the world, warehouse stocks in five industrial centers of the United States, factory stocks at the main Worcester plant and at the Norton plants in Canada, England, Australia, France, Germany and Italy.

ENGINEERING—a Norton field staff of abrasive engineers and Norton factory specialists co-operating with over 2,500 distributor representatives the world over.

RESEARCH—a staff of over 135 trained scientists and technicians in well-equipped laboratories—constantly developing new abrasives, new bonds and improved manufacturing processes.

*Products of Behr-Manning Division

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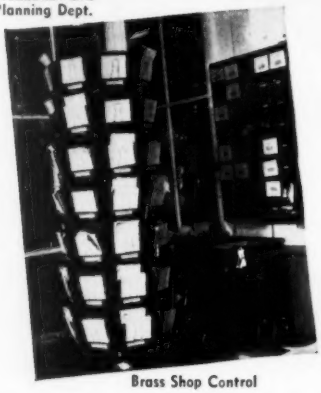
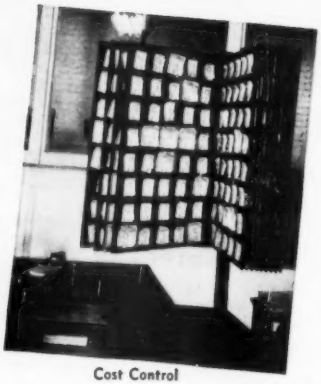
Production and Planning Dept.



Brass Shop Control



Cost Control

How MASON-NEILAN Simplified Production and Cost Control

Mason-Neilan Regulator Co., Boston specialist in pressure, temperature and liquid level control equipment, simplified successfully more than eleven years ago with McCaskey "One-Writing and Visible Filing" systems. Their objective was to "hold down costs without sacrificing high quality standards."

Their controls include: the machine load for all machines at all times; the delivery of material to machines; the progress of each production order and the number of pieces produced daily compared with standards and schedules; the daily cost status of a thousand jobs in process; detailed costs almost immediately after their completion.

Three-copy time tickets made at "one-writing" provide identical data from the shop to three control divisions where they are immediately visualized on McCaskey Planning Boards for quick reference by planning and cost clerks. Their systems are stream-lined for speedy, effective action.

Write for a demonstration and suggestions for an application to your particular needs—or send for a copy of "The ABC's of Production Control" and other descriptive folders.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

4-in. voltmeter, an on-off switch, pilot light, screwdriver adjustments for output voltage and sensitivity. Superior Electric Co., Bristol, Conn.

•

Barrel Stand

Portable barrel stand, called the Wizard, raises heavy barrels and drums for emptying into smaller containers. It features arc-welded construction, wrought-iron toes, semi-steel or rubber-tired wheels. Hardwood handles are extendable for more lifting leverage; steel rollettes on top of the stand make it possible to turn the barrel into required position. Modern Equipment Co., 2007-11 Cuming St., Omaha 2.

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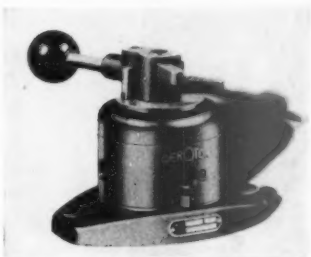


Oil Pilot Valves

Line of oil pilot valves, series 7000, for remote control of oil-pressure-operated 4-way hydraulic valves. Operation control is obtained by a fork lever design, which, when actuated by a moving part of the device being powered, permits remote reversing of the main valve. Both fork lever and fork-and-hand lever types are available. The later permits manual interruption of the cylinder's forward or return stroke at any time. Available in pipe line, base, foot, or panel mountings, with all ports blocked in neutral, open to exhaust in neutral, and with cylinder ports open to exhaust and pressure port blocked in neutral. Gerotor May Corp., Maryland & Oliver Sts., Baltimore 3.

•

Protective Gasketing

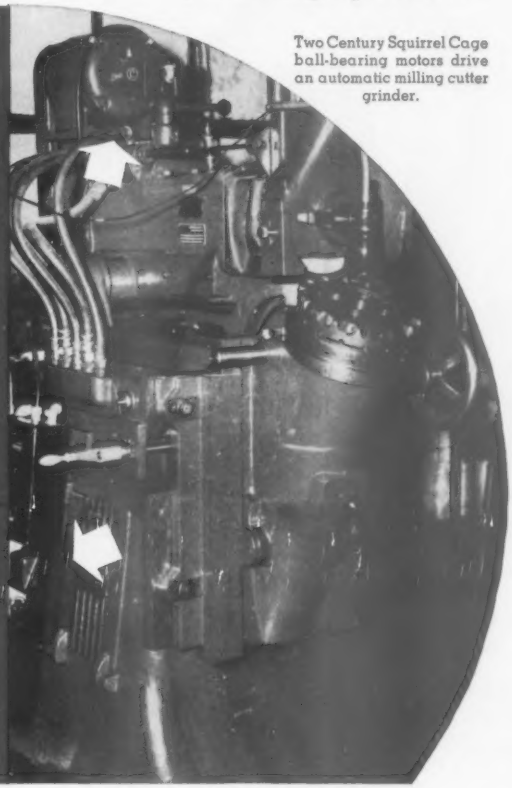
Zinc-chromate-impregnated felt is intended for use as protective gasketing or sealing between all types of mating surfaces, such as flanges and lapped or butted joints. It is said to

Designed to Protect the Accuracy of your Equipment—

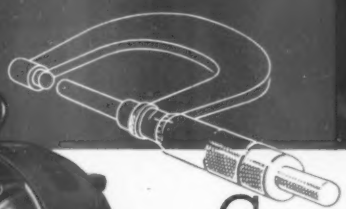
Century

MOTORS

Help Maintain Tool Room Precision on Production Jobs



Two Century Squirrel Cage ball-bearing motors drive an automatic milling cutter grinder.



Popular types and standard ratings are generally available from factory and branch office stocks.

Century motors are designed, produced and tested to give you all the precision your machine was designed to provide.

Century motors' unusual freedom from vibration contributes to closer tolerances, smoother operation and fewer rejects. These motors are precision built to close tolerances—ruggedly designed to maintain alignment—and are carefully balanced, electrically and mechanically.

Century motors are built in a wide range of types and kinds, in sizes from 1/6 to 400 horsepower—for operation on single phase, three phase and direct current.

Specify Century motors for all your electric power requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

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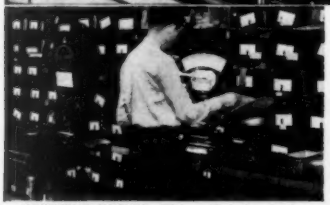
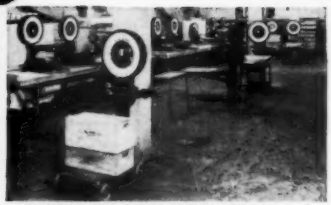
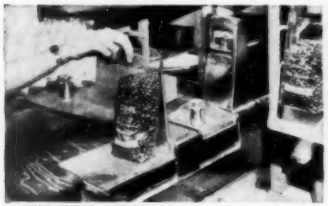


COUNTING SCALES—These Toledo Scales count small parts rapidly and accurately.

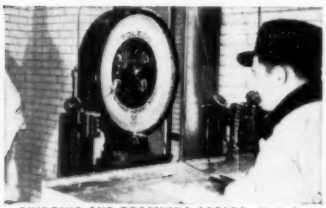


PORTABLE AND BENCH SCALES—Widely used for weight-and-cost-control throughout modern plants.

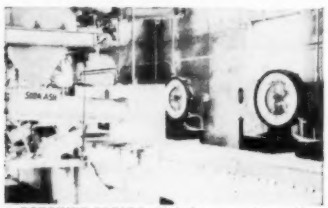


OVER-UNDER SCALES—The Speedweigh saves time in packing, filling, check weighing.

TOLEDO PRINTWEIGH SCALES stop errors . . . print BIG figures—ACCURATE weights—with split-second speed!



SHIPPING AND RECEIVING SCALES—Toledo Accuracy prevents small errors from multiplying into big losses!



BATCHING SCALES—Toledos save time and safeguard quality . . . make batching quick and sure.

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Toledo Scale Co.
Toledo 12, Ohio

provide either exclusion or retention of air, water, dust, and other materials. Available in tapes, sheets, or stampings; any width; 1/32-, 1/16-, 1/8-, and 1/4-in. thick, with pressure-sensitive adhesive back. Manufacturer states that it prevents corrosion as well as electrolysis between dissimilar metals, is resistant to water, saline solutions, and flame. It will not oxidize under locked-in pressure, but remains pliable. Suitable for replacement gasketing in air conditioning, piping and instrument or gage repairing. Products Research Co., 5426 San Fernando Rd., Glendale, Calif.

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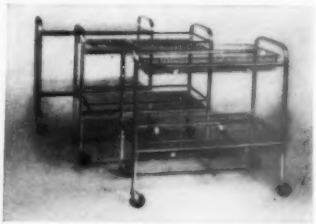

Special Purpose Carts

Line of carts, called Labconco, is designed to save steps, time, and breakage in the laboratory or plant. It includes portable tables and units designed for carrying chemicals, glassware, and flasks. All are of one-piece construction, with rubber-tired ball-bearing casters. Carrying surfaces are compressed asbestos to withstand acids, alkalis, and heat. Laboratory Construction Co., 1115 Holmes St., Kansas City, Mo.

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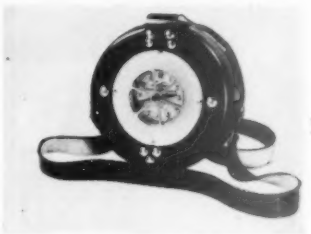

Watchman's Clock

Eight-day jeweled watchman's clock comes in an aluminum case with leather pouch and carrying strap. Keys of corresponding station boxes fastened to the wall at points throughout the plant are inserted into the clock by the watchman to record time of visit on paper record disks; a year's supply is provided with the clock. Latham Time Recorder Co., 76 3rd St., N. W., Atlanta, Ga.

•

Selenium Rectifiers

High-voltage selenium rectifier cells are designed for a d.c. voltage of 24 volts per cell, with an rms. a.c. voltage of 33 for single-phase bridge circuits. Available in six round sizes from one to 4 3/8 inches in diameter, in 5-in. square, and 4 1/4 x 6-in. sizes. Applications include communications

Wet mopped 6 times and it's still shining!

THE REASON—it's waxed with Johnson's Brown Label No-Buff Floor Finish!

When your floors are waxed with Johnson's Brown Label, *they stay waxed and bright through heavy traffic and wet mopping!* Floors retain 90% of their original gloss after as many as 6 wet moppings. Think what this means from a maintenance angle—easier cleaning, less time, less waxing, greater economy in maintenance labor . . . maintenance dollars. Put your floors on the Johnson Brown Label basis *now*. Use the coupon below to send in your order or have a J-Man demonstrate the amazing shine qualities and wear resistance of Johnson's Brown Label.

Try this easier way to clean–wax–maintain your rubber and asphalt tile floors

CLEAN

Mop on solution of Johnson's Floor Cleaner to soften all old wax films and dirt for easy removal.

SCRUB

After Cleaner has worked for 2 or 3 minutes, scrub thoroughly with electric scrubbing machine to break up old films.

RINSE

Remove all Cleaner solution, wax and dirt from floor by mopping with clear water rinses. Allow floor to dry completely before waxing.

WAX

With mop or applier spread on full, even coat Johnson's Brown Label No-Buff Floor Finish and let dry. For maximum luster and slip resistance, apply 2nd coat same as 1st.

S. C. Johnson & Son, Inc., Maintenance Wax Dept.
1526 Howe Street, Racine, Wisconsin

- ☐ Ship 5 gal. can Johnson's Brown Label No-Buff at $2.75 per gal.
- ☐ Ship 5 gal. can Johnson's Floor Cleaner at $2.35 per gal.
- ☐ Have your J-Man call
- ☐ Send Free Floor Care Manual

Name _____

Title _____

Establishment _____

Address _____

City _____ *State* _____

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Makers of
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The Fasteners that add
EXTRAordinary strength to your product
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Ask your jobber for Cleveland Fasteners

services, vacuum tube power supplies, electronic controls, electrostatic precipitator power supplies. Westinghouse Electric Corp., Box 868, Pittsburgh 30.

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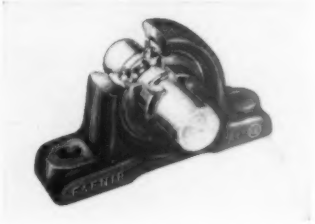


Ball-Bearing Pillow Blocks

LAO series of pillow blocks, equipped with "Mechani-Seal" ball bearings, is available in nine shaft sizes ranging from 1 3/16 to 2 15/16 inches. Unit incorporates a heavy-series ball bearing with wide inner ring and self-locking collar. Labyrinth-type closure plus an external slinger member is said to throw off contaminants when operating at normal speed. A combination synthetic rubber and felt washer has been made an integral part of the seal for protection at low speeds or under adverse atmospheric conditions. The Fafnir Bearing Co., New Britain, Conn.

•

Fish Tape

For use in all types of conduit, including aluminum, fish tape, called Coil-Flex, is flexible, can be pushed or pulled through any bends allowed by electrical code, according to maker. Its round surface protects the hands and facilitates sliding through the conduit; ends are smooth and round to avoid snagging. Tape consists of a 25-ft. length of 11/32-in.-diameter steel spring with a rustproof inner steel cable. Threaded male fitting on one end and a female fitting on the other makes it possible to join two or more lengths together. It can be rolled into a 10-in.-diameter circle, and when thrown on the floor, will spread out, not kink, snarl, or spring loose. Ideal Industries, Inc., 1416 Park Ave., Sycamore, Ill.

•

Hand Truck

Space-saving hand truck, made of heat-treated aluminum alloy, has a rated capacity of 500 pounds, can lift more than 1500 pounds (by static

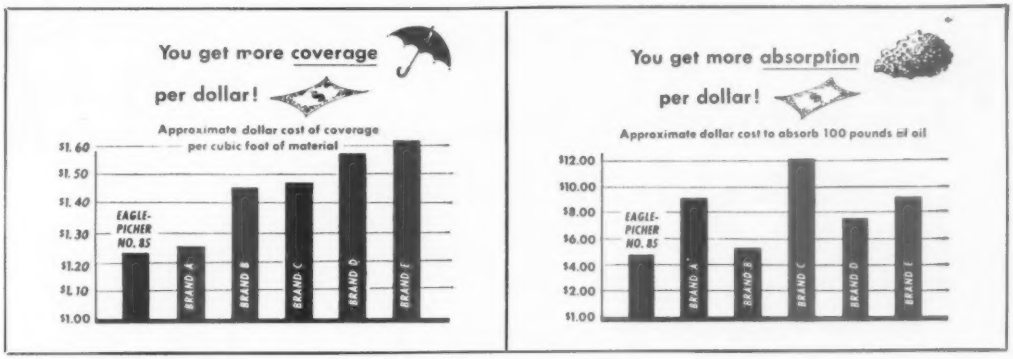
New, entirely different, highly effective

EAGLE-PICHER FLOOR-DRY No. 85

gives you

More for your dollar!

Eagle-Picher's Industrial Floor-Dry No. 85 is a granular mineral compound possessing remarkably high absorptive properties for oil, grease, kerosene, water and other liquids. A chemically inert, non-combustible material, it is insoluble in such liquids . . . and its light weight assures high floor coverage. The results of comparative scientific tests show that Eagle-Picher Industrial Floor-Dry No. 85 outperforms five other leading floor drying compounds—both in absorptive properties and coverage by weight. *Packed in 50-pound, multi-wall, Kraft paper bags.*



You get these *extra* advantages!

Extra safety . . . because Industrial Floor-Dry No. 85 is insoluble, and retains its granular form even when saturated with oil or water . . . it provides a non-skid, non-slip surface. It literally spreads a "safety carpet" over your floor, which prevents accidents, is appreciated by employees . . . and encourages increased production.

Extra service . . . The superior absorptive qualities of Industrial Floor-Dry No. 85 allows it to remain in use on the floor for a much longer period of time. Consequently, it saves cost of extra material used in frequent replacements, as well as man-hours required to make that replacement. Its light color brightens the work area. And it is easy to use . . . by hand, shovel or any proved mechanical device.

Extra economy . . . because of its superior absorptive, coverage and handling properties, Eagle-Picher's Industrial Floor-Dry No. 85 gives you positive reduction in your operating costs. Why not send in the coupon for a free descriptive booklet.

The Eagle-Picher Company

Since 1843

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THE EAGLE-PICHER COMPANY
Dept. FM-69, Cincinnati (1), Ohio

Gentlemen: Please send me more information about Eagle-Picher Industrial Floor-Dry No. 85.

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tests), weighs 12 pounds, measures 12 inches wide, 45 inches high. Ball-bearing equipped wheels with Zerk pressure fittings and extra thick rubber tires provide ease of operation. Available with or without stair climbers. Honeyman Mfg. Co., 1217 N. W. Everett St., Portland 9, Ore.

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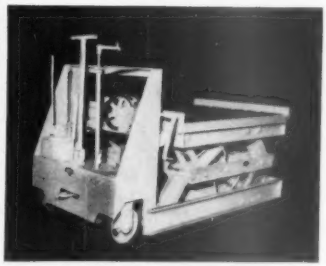

Heavy-Duty Die Truck

Designed for handling large dies, 16,000-lb.-capacity hydraulic elevating truck has a 48x57-in. platform. Roller top, consisting of five rows of rollers on 4-in. centers, facilitates transfer. With this in place, platform can be lowered to 24 inches, elevated to 38. To provide three inches less height in either position, the top can be removed; dies are then supported by a flat steel top. Four hydraulic hoists, operated by a 2-speed hand pump, provide elevation, and a finger-tip release lever controls lowering speed. Truck can be anchored by screw-type lock against the floor. Available in a range of top sizes and capacities to meet specifications. Lyon-Raymond Corp., 2297 Madison St., Greene, N. Y.

•

Tiering Units

Hardwood skid and box-top tiering units are of all-bolted construction to permit replacement of damaged sections. Corner angles on the inside provide reinforcement. Units are of two types, stenciled A and B. The A type is built with extended flanged corners both top and bottom to fit over skid corners and also to hold B-type boxes, which are used to increase box capacity to any depth required and are built to stack on top of each other. Both types have four sides only, the bottom being formed by the skid. Skid legs fit inside the

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The DH-2 6020 electrode can't be beat when it comes to speed. Test it yourself against any electrode—you'll see what we mean. In addition to cost-cutting speed, the DH-2 has these important features.

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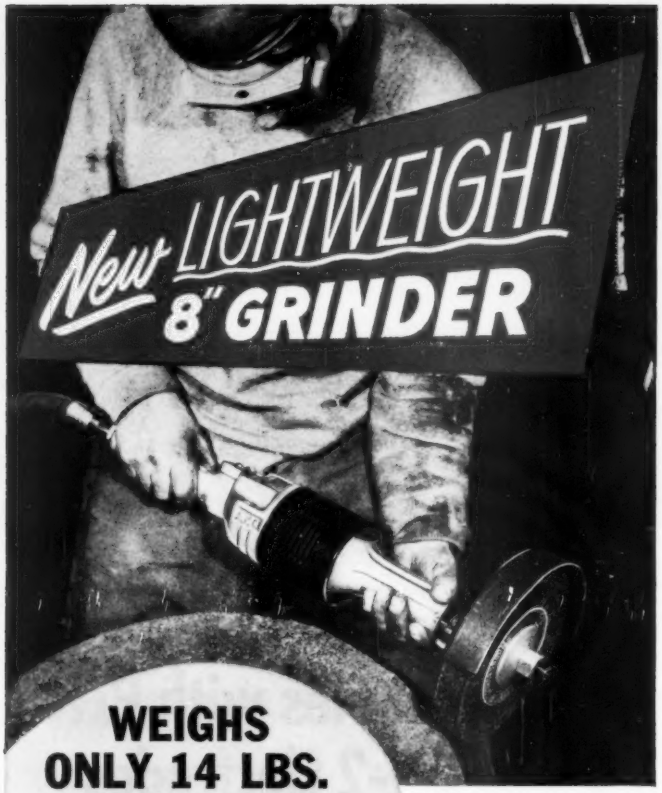

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without guard or grinding wheel

SAVES LABOR... less fatigue!

SAVES TIME... greater cutting power

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RUGGED... DEPENDABLE ... POWERFUL

This new ARO lightweight Grinder is made with tough magnesium castings for lightness... rugged steel motor housing for protection... styled for a perfect grip... and has real power!

Straight or spade handle models. Speeds, 4200 to 6000 RPM for 6" and 8" grinding wheels, radial wire brushes or cup wire brushes.

Send coupon for bulletin. See your nearest industrial distributor.

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Street_____

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extended upper flange so that stacking one made-up unit upon another is only limited by the extent of the fork-truck lift. Ironbound Box & Lumber Co., 37 Hoffman Pl., Hillside, N. J.

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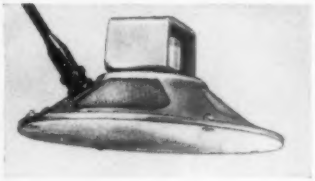

Flame-, Explosion-Proof Loudspeakers

For use where loudspeakers are located in places considered hazardous because of the presence of explosive or combustible gases and dust, flame- and explosion-proof speakers are suitable for use in chemical plants, refineries, munition mills and elevators, and similar areas. Units may be obtained in water-, fungus-, and bug-vermin-rat-proof models, which all include the flame- and explosion-proof features as well. The Signet Development Co., 188 W. Randolph St., Chicago 1.

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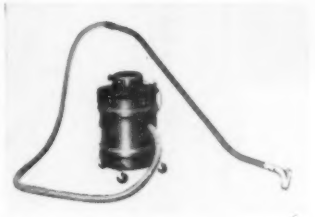


Wet or Dry Vacuum Cleaner

Portable wet or dry vacuum cleaner operates without belts, dust bags, or brushes. It may be used either as a dry pick-up unit or, with an adapter, as wet and dry pick-up machine. Capacity of tank is 1½ bushels or 9½ gallons. Equipped with motor which delivers a 57-in. waterlift, cleaner rolls on four hard-rubber swivel casters, weighs 30 pounds, measures 27½ inches high, 16 inches in diameter. Standard equipment consists of 10 feet of flexible hose, steel cleaning wand, floor tool and upholstery tool. Additional equipment available includes an adapter for wet pick-up, with automatic shutoff float, a 15-in. rubber squeegee, and various other special cleaning tools. The American Floor Surfacing Machine Co., 539 S. St. Clair St., Toledo 4.

•

Shelving Units

Adjustable open all-steel shelving units are available in eight sizes ranging from 8x24 to 24x36 inches, in lengths from 3 feet 1⅛ inches to

"FLEETWELDERS" ELIMINATE ARC BLOW ...increase welding speed 10%

By J. K. GANNETT
Vice President in charge of Engineering and Research,
The Austin Company,
Cleveland, Ohio

J. K. Gannett

The solid, uniform welds required in our heavy structural work are now being made easier and at lower cost with AC arc welding. By eliminating the restrictions of arc blow in the construction of heavy structural weldments like the roof truss shown, our fabricating shop is today able to take full advantage of higher welding currents with resulting substantial increases in welding speeds.

Structural members like the jack truss shown in the photographs are shop fabricated from wide flange beams and from plate. Component members are first positioned accurately for close fit-up and tack welded. One side is then partially welded with fillets of ¼" "Fleetweld 7" electrode using 500-amp. Lincoln "Fleetwelder" AC arc welders.

Fig. 1. *Arc welding diagonals to chord with the 500-amp. Lincoln "Fleetwelder" AC welders at the structural fabrication shop of The Austin Company.*

After the initial side welds are made, the truss is placed in an upright position as shown in Fig. 2 and continuous welds completed around each member, framing into the lower chord. The truss is then flopped over and similar welding is done for the members framing into the other chord. This procedure permits us to use fast downhand welding techniques on all connections and assures us solid, high quality welds on all joints at the lowest fabricating cost.

Using the AC "Fleetwelders," thus eliminating arc blow, allows our operators to increase their current to over 300 amperes with no difficulty in maintaining a steady, constant arc at all times. Increased amperage, combined with steady, uninterrupted operation, has cut our welding time about 10%.

Fig. 2. *Fabricating all-welded 40-ft. jack truss for factory building framework. Top and bottom chords are 10"-21WF beams; diagonals are 8"-17WF beams. Welds are downhand, single pass, ⅜" fillets.*

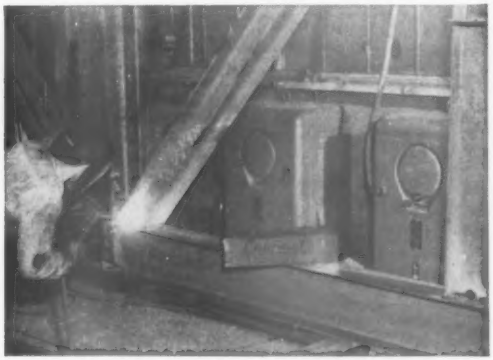
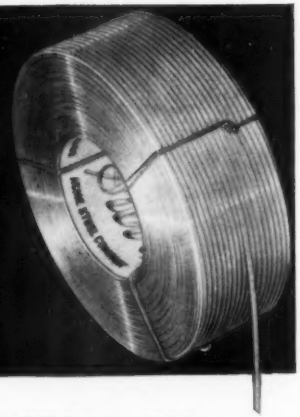


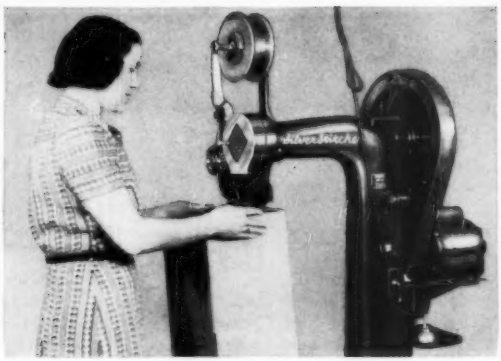
Fig. 3. *Finishing all-around welding of diagonal to bottom chord. Weld is made with single pass ¼" diameter "Fleetweld 7" electrode. Welding current is 310 amps.*

The above is published by **THE LINCOLN ELECTRIC COMPANY** *in the interests of progress.*
For further information on "Fleetwelders," write for Bul. 366. The Lincoln Electric Company, Dept. 272, Cleveland 1, Ohio.

Carton assembly and closure costs LESS when you use an

ACME SILVERSTITCHER





This Acme Post-type Silverstitcher is only one of many standard models. Acme also tailors special stitching machines precisely to your needs.

The thousands of companies who use Acme Silverstitchers and Silverstitch box-stitching wire report substantial savings of time and materials:

- **A packer of medical kits cut closure costs 81%!**
- **A maker of fluorescent lamp bulbs saved $15,000 in one year!**
- **An asphalt producer doubled his output with fewer men!**
- **A banana shipper increased production 5 times, at 1/10 former costs!**

If your product goes into corrugated or fibreboard containers, you should be able to cut packaging costs with Acme equipment and methods. The coupon below will bring an Acme Shipping Specialist to explain why . . . and how. Or ask for free booklet, "Profit by Stitching."

STITCHING WIRE DIVISION

ACME STEEL COMPANY

NEW YORK 17 ATLANTA CHICAGO 8 LOS ANGELES 11

ACME STEEL COMPANY, Dept. FM-69,
2838 Archer Avenue, Chicago 8, Illinois.

☐ Send free booklet, "*Profit by Stitching.*"
☐ Have representative call.

Name _____

Company _____

Address _____

City _____ Zone ____ State _____

10 feet 1½ inches. The 1x1x⅛-in. angle-iron corners are punched every 1½ inches and, with use of dividers and outer steel shell, permit units to be converted to closed type shelving. Designed to carry a load of 100 to 150 pounds, units are available in seven solid colors and a variety of sizes and strengths. Hilco Mfg. Co., 1721 N. Elston Ave., Chicago 22.

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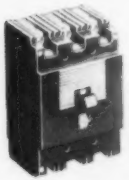

Circuit Breakers

Small-size 50-amp. 600-volt and 100-amp. 250-volt circuit breakers, ML-1, are built with a thermal-magnetic (coilless) tipping mechanism which holds harmless momentary overloads, but trips before wire insulation overheats on continuous overloads. Manufacturer states that the magnetic element trips quickly on shorts to localize damage. Unit is available either as a circuit breaker or a circuit interrupter of high capacity, in various types of enclosures, to meet specific applications. Range is 15 to 50 amperes at 600 volts a.c. or 250 volts d.c.; 70 to 100 amperes at 250 volts a.c. or 125/250 volts d.c. Square D Co., 6060 Rivard St., Detroit 11.

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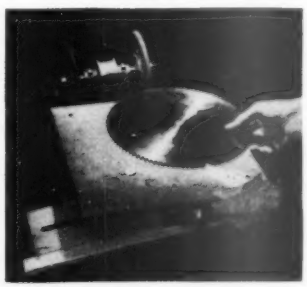

Saw Sharpener

For use on all types of circular saws ½ to 16 inches in diameter, Model 160 saw sharpening fixture is mounted on the same base as its two motor-driven grinding wheels. The table on which the saws are held and turned during sharpening swivels to and from the grinding wheels. Adjustable stop limits the amount of swivel angle to the wheels to provide uniform grinding depth. Adjustable index finger sets the distance between saw teeth. Table top may be tilted over 30 degrees either side to meet requirements of different types of saws. One of the two grinding wheels has a 45-deg. angle on one side for cross-cut or fine teeth on combination saws; the other is

a lot of reasons why

FA SWITCHBOARDS

are *Dependable!*

Featured part of this FA Switchboard is the safety-type FA Klampswitchfuz which combines both disconnect switch and fuse protection in one unit . . . for more perfect contact and safer maintenance. Heavily electro silver-plated, copper contacts are "squeezed" together in one locking motion that clamps fuses at the same time, for 30 to 200 amps; for more than 200 amps., FA KAMKLAMP pressure-type fuseholders are used. Access to fuses only when door is open . . . prevents contact with live parts.

Capacities: 30 to 1200 amps., 250 volts, AC or DC; and 30 to 400 amps., 575 volts, AC, in 2, 3 and 4 poles.

Compact . . . unit design, welded construction to provide long-lasting, trouble-free service.

Flexible . . . assembled and shipped ready for connection of main and branch circuit cables . . . units can be arranged singly or grouped . . . sections readily fit together . . . removable end walls permit adding sections to either side.

Tailored for your needs . . . the number and capacity of FA Klampswitchfuz switches are provided *as specified by you.*

Safer Operation . . . dead front, completely enclosed, with fuses accessible only when switch door is open.

More efficient . . . less maintenance required . . . ample capacity . . . modern design . . .

Add these reasons together and you will find that YOUR sum total checks with ours . . . DEPENDABILITY.

There are many other reasons why the FA Klampswitchfuz Switchboard is dependable, so contact your FA Representative for details.

FA TRADE MARK

Frank Adam Electric Co.

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Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

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SINCE 1899

Kester is constantly developing new and better flux-core solders. At present there are over 100,000 types and sizes, each designed to do a certain job in the most efficient manner.

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KESTER SOLDER COMPANY

4201 Wrightwood Avenue, Chicago 39, Illinois

Factories Also At

Newark, New Jersey • Brantford, Canada

1899 50th Anniversary 1949

KESTER SOLDER

5/16 inches wide, with a radius for sharpening rip saws and large teeth on combination saws. Treyco Products, 264 Hartford Ave., Buffalo 17.

•

Bolt Cutter

Center-cut bolt cutter with chisel-type jaws is designed for use on case-hardened bolts, chain, reinforcing rod, and other hard materials. The jaws are of heat-treated forged tool steel. Manufacturer claims that through compound leverage, the tool affords 2 tons' cutting power at the jaws with 50 pounds pressure at the handles. Available in 18-, 24-, 30-, and 36-in. sizes with capacities up to 7/16 in solid red. Head assembly will fit standard bolt cutters now in use, and may be obtained separately. Manco Mfg. Co., Bradley, Ill.

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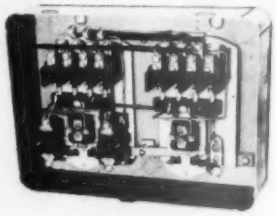

Magnetic Reversing Starters

Line of a.c. magnetic reversing starters is designed for control applications such as machine tools, woodworking machines, and similar equipment. Three-pole starters are available for across-the-line starting and reversing of polyphase motors to 200 hp., 550 volts, 60 cycles. Four-pole starters with ratings of 7½ hp., 550 volts, 60 cycles are suitable for use with externally reversible single-phase motors of the four-wire split-phase, capacitor or repulsion-induction types. Ward Leonard Electric Co., Mount Vernon, N. Y.

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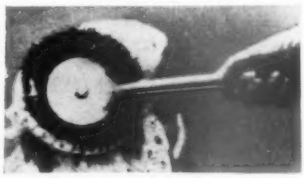

Swirling Cleaning Brush

Revolving brush, called Swirl-O-Matic, is driven by water pressure to wash windows, glass brick surfaces, walls, floors, or equipment. It may be attached to any hose, and when held lightly against the surface, its swirling action cleans, rinses, and

SUSTAINED POWER!

That's why SKIL Saw saves you minutes and money on every cutting job!

Are you looking for ways to cut costs and cut production time? Here's the answer: *Cut with SKIL Saw!*

SKIL Saw motors have the extra power that bites right into wood, plastics, metals . . . and cuts right through *fast and true!* They have the extra stamina that speeds special blades through flat or corrugated steel, lead sheets or toughest compositions.

On production lines, in shipping and receiving rooms, for all maintenance and remodeling . . . you can't beat the *sustained* power of SKIL Saw for speed and economy. Ask your SKIL Tool Distributor for a demonstration.

IN SHIPPING AND RECEIVING ROOMS

SKIL Saw opens crates faster. Adjustable depth of cut protects contents from damage. Crating lumber saved for re-use.

CAR BRACING

is faster, surer, safer with SKIL Saw to cut right inside or beside the car. SKIL Saw makes all cuts . . . cross, rips and bevels . . . for rigid bracing.

ON PLANT MAINTENANCE

Versatile SKIL Saw performs dozens of shop up-keep jobs. Makes every kind of cut in wood, metals, stone, tile and compositions. Light, perfectly balanced, easy-to-use.

SKIL Tools

SKIL Tools are made only by

SKILSAW, INC.

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Factory Branches in Principal Cities

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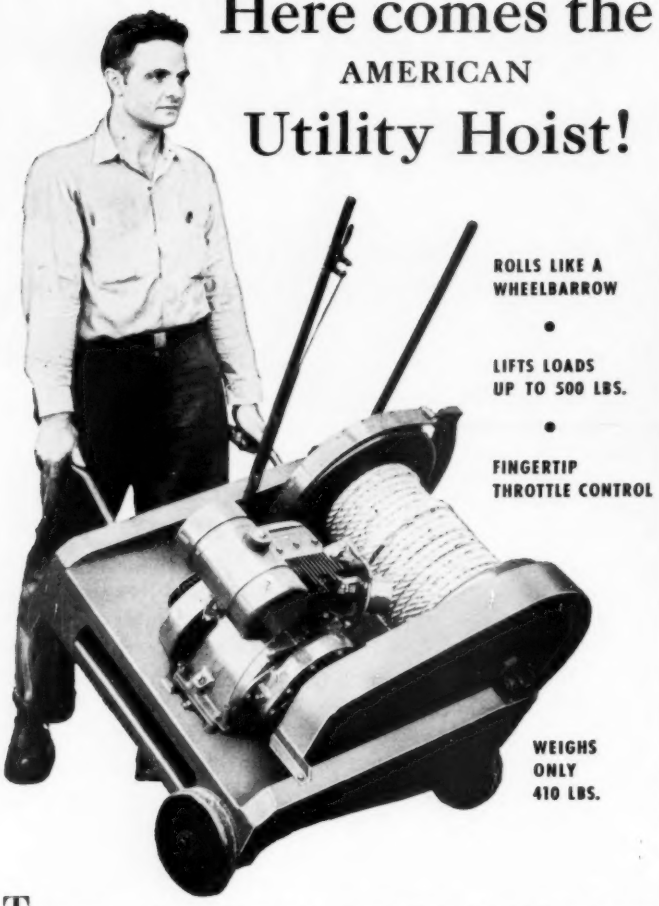
Here comes the AMERICAN Utility Hoist!



ROLLS LIKE A WHEELBARROW

•

LIFTS LOADS UP TO 500 LBS.

•

FINGERTIP THROTTLE CONTROL

WEIGHS ONLY 410 LBS.

The AMERICAN UTILITY HOIST will lift brick, tools, cement blocks, roofing or any other load up to 500 lbs. more profitably than any big hoist on the market. And compared to hand work, it's worth two or three extra men on the payroll.

Here, at last, is a light hoist that's an all-around performer, offering exactly the kind of speed and power you need. The drum will spool 1700 feet of $\frac{3}{8}$" wire rope, or 400 feet of $\frac{3}{4}$" manila. With standard gearing it lifts 500 lb. loads at 200 feet per minute. If you want extra power, order special gearing to handle 650 lbs. at 150 FPM; or for extra speed you can have it geared for 200 lbs. at 500 FPM.

This hoist goes anywhere . . . and anybody can run it. Haul it on a light truck . . . wheel it to the job like a wheelbarrow . . . counterweight it with a heavy plank in the slotted frame, and you're ready for work. Fingertip throttle control is right on the brake lever. Has 14" disc clutch, 16" external band brake, governor-controlled air cooled engine. Immediate delivery from stock. Call your distributor, or write us direct, for catalog.

American Hoist
and DERRICK COMPANY
St. Paul 1, Minnesota

Plant No. 2: So. Kearny, N. J.

Sales Offices: NEW YORK, CHICAGO, PITTSBURGH

AMERICAN HOIST & Derrick Co.
ST. PAUL 1, MINNESOTA

20

Please send literature and prices on the AMERICAN Utility Hoist.

Name _____

Company _____

Address _____

City _____ State _____

9115

polishes in one operation, according to maker, with no rubbing or wiping necessary. Stationary bumper brush prevents splashing and cleans corners. Extension handle is available for reaching high places. Made of aluminum and brass, it is lightweight, cannot corrode or rust. Melaire Distributing Co., 420 Lexington Ave., New York 17.

•

Paint Striper

Two models of a brushless gravity-fed controlled-flow paint striper have spreaders of steel ranging in widths from two to eight inches. They are interchangeable but not adjustable. A distributing apron receives the paint from the gravity line and feeds it evenly through the funnel-shaped bottom to the finger rollers which spread it. Suitable for use on concrete, asphalt, wood, macadam, or any reasonably smooth surface. Model A, with 9-gal. tank, weighs 60 pounds, is 47 inches long, 24 inches wide, 38 high. Model B is similar in design, with a 5-gal. capacity. Universal Marine & Mfg. Corp., 137 Alexander St., Yonkers 2, N. Y.

•

Indicating Controller

Called the Multi-Switch Capacitrol, indicating controller is available with a maximum of four switches (S.P.D.T.) which provide a selection of six different sequences for various control functions. A high-resistance, fully compensated, direct-reading meter movement with Alnico V. magnet is used for applications which fall in the pyrometric range. Models using resistance thermometer measuring systems are available for low-temperature operation. Wheelco Instruments Co., 847 W. Harrison St., Chicago 7.

•

Foot-Pedal Water Cooler

Automatic water coolers in foot-pedal models F-6 and F-10 occupy floor space 14x15 inches. Electrolytic polish finish of the stainless steel top may be simonized to minimize finger

6 Wiring Ideas

TOUGH ENOUGH FOR TOOLROOMS

Cutting costs is the toolroom's job. And all wiring material in a toolroom has got to be tough enough to work economies every step of the way.

That's why we've picked six cost-cutting General Electric wiring materials right off your distributor's shelves to help you get full value out of every dollar.

1. **HEAT-RESISTANT** Deltabeston* wires go a long way toward reducing maintenance. Made for locations like this, where ambient heat and high-level lighting circuits are a problem, Deltabeston wires are a "must" for every shop. Consider Deltabeston wires and cables for all circuits where heat is a threat, and wherever high current densities are involved.

2. **HEAVY-DUTY SWITCHES** selected from the complete General Electric line have the toughness it takes to stand up in a toolroom. They're totally enclosed to keep out flying chips and dust—built to take a beating day after day. Choose the switch for the job you want to do from General Electric's wide range of 20- and 30-ampere types.

*Trade-mark Reg. U. S. Pat. Off.

3. **HEAVY-DUTY OUTLETS** have got to be tough, too, to take the abuse of a toolroom. Three-wire outlets from the General Electric line are available in types to meet the most difficult specifications. Sturdy construction and tough materials are used throughout in these heavy-duty units.

4. **PORTABLE CORDS**—General Electric Flamenol* portable cords are proving that they can take it every day on jobs like this. Thermoplastic jacket has the flexibility and strength needed for tools that are constantly in use. These cords take hard knocks and abrasion in their stride—resist acids, alkalies, water, and oil. Use Flamenol portable cords for reduced maintenance on medium- or heavy-duty tools.

5. **BUS DROP CABLE** is another tough item from General Electric's line of wires and cables—designed to take a beating in a difficult spot. Neoprene jacket takes plenty of abuse—flexes easily for installation in problem locations—stays in for a long, long time.

6. **FLEXIBLE CONDUIT** is the protection you need on motors and motor-driven tools. Wherever there's vibration or movement, use General Electric flexible conduit. Its strip-wound construction lets it move with the tool—steel gives it the strength wiring needs for protection.

These are just a few of the tough, long-life items in the complete General Electric wiring materials line. Your distributor can supply you with these or any of the other materials you need to do your job well. Ask him about them, or write for information to Section K15-64, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

Costly Vapor
$37.50 an ounce is expensive perfume . . . but in your own plant—unseen, unsuspected—you may have vapor 5000 times more costly!
Costly Vapor
$187,500
One ounce of vaporized gasoline has the potential explosive force of two sticks of dynamite.
How much it may cost you is problematical . . . but this we know: highly explosive vapors lurk around many normal factory operations. These hidden hazards can wipe out your business in one blinding flash. One spark can do it! For that reason . . . industry has turned to the Protectoseal System to stop fires before they start. Protectoseal equipment safeguards property wherever flammable liquids are stored, dispensed or used . . . cuts costs, speeds production and reduces insurance rates.
The PROTECTOSEAL Company
1960 S. Western Avenue • Chicago 8, Ill.
Since 1922 . . . Pioneering Fire Prevention Devices for Industry
Stops fires before they start
FREE: Analyze hidden hazards on your property with "Self-Checking Chart" and booklet of FIRE Facts, or request an inspection by Protectoseal engineers. No obligation.

smudge. Deep basin and splash guard are said to eliminate spray and splash, and openings in the bubbler nozzle by-pass water to basin to eliminate attempts to squirt water. Cold-water storage tank is 18-8 stainless steel; precooler is seamless copper shell and coil construction. Models F-6 and F-10 deliver approximately 9 and 15 g.p.h., respectively under average conditions. Cordley & Hayes, 443 4th Ave., New York 16

•

Acid Containers

Closed-type unbreakable container for carrying acids, alkalis, and other corrosive liquids without spillage, available in 1-, 3-, and 5-gal. sizes, is one of a line including pails, dippers, measures, and funnels. Constructed of perforated steel shell coated on both sides with $\frac{1}{8}$-in. seamless rubber or synthetics, according to requirements, the inner and outer coatings are tied through the perforations for permanent adherence, leaving no metal exposed. Both carrying and tipping handles of container are covered, and rubber stoppers for top and spout are standard equipment. Automotive Rubber Co., Inc., 8601 Epworth Blvd., Detroit 4.

•

Diaphragm-Actuated Valves

Series D-112 diaphragm-actuated valves, intended for low-pressure service, are available in eight sizes, ranging from $\frac{1}{4}$ to 3 inches, for pressures of either 300 or 500 p.s.i. The 300-p.s.i. valves are fabricated from hydraulic bronze, the higher pressure models of high tensile alloy bronze. Stems, seats, and disks are

INVINCIBLE
Flux Recovery Systems

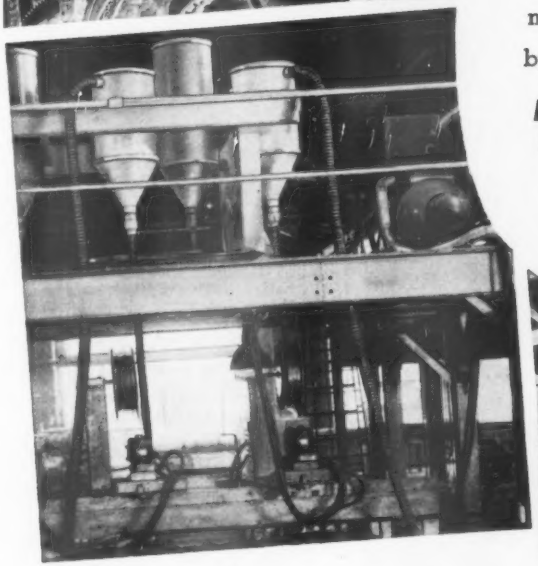
This installation *automatically* salvages useable flux and returns it to hopper of welding head. Circular magnets are being welded.

Quickly Repay Their Costs

• On submerged arc welding jobs, Invincible Flux Recovery Units save money by: **1** Salvaging *all* unfused flux, **2** Operating far more efficiently than manual methods, **3** Reducing welding rejects by removing all fine dust (flux flour).

FREE FOLDER on FLUX RECOVERY

Describes and illustrates the complete Invincible line . . . *send for your copy Now!*



Flux is being recovered simultaneously from *2* welding heads on this installation. Water tanks are being welded.

Welding locomotive parts. *Only* primary separator tank is elevated, thus eliminating need for another supporting jig.

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

DARNELL CASTERS
& E-Z ROLL WHEELS

An
EXTRA
MEASURE
of QUALITY

DARNELL CORP. LTD. 60 WALKER ST., NEW YORK 13, N.Y
LONG BEACH 4, CALIFORNIA 36 N. CLINTON CHICAGO 6, ILL

said to be resistant to corrosion and to minimize electrolysis. Valves may be obtained factory assembled or changed in the field of normally open, normally closed, or for three-way operation. Suitable for vertical or horizontal mounting, the angular construction of the valves is said to provide unrestricted flow, improve valve capacity, and reduce back pressure and frictional losses. Emmett Machine & Mfg., Inc., 2249 14th St., S.W., Akron 14, O.

•

Lift Truck

Maximum lift of 120 inches is achieved by 2000-lb. capacity electric fork truck, called Aisle Saver. Free initial lift is 63½ inches. Truck is equipped with a 83-in. collapsible mast which incorporates an auxiliary twin-cylinder hydraulic lifting unit. Collapsed height, 83 inches over-all, permits the truck to operate in low ceiling areas. Manufacturer states that it will right-angle stock from 8-ft. aisles with a 40x32-in. pallet. Standard tilt is 5 degrees back and 3 forward. Crescent Truck Co., Lebanon, Pa.

•

Blower-Type Unit Heater

Featuring a squirrel-cage fan, blower-type unit heater, known as the Pittsburgh blower unit, Series CB, is designed for installations which require heated air at greater velocities and against greater static pressure than provided by standard unit heaters equipped with conventional propeller-type fans. Supplied

One of the many ways that

industry makes multiple savings with Gulf Quality Oils and Greases:

GULF NO-RUST NO. 3

prevents corrosion on polished steel surfaces—

saves refinishing costs on overseas shipments

Paper machine dryer and calendar rolls must have a mirror-like surface to produce fine papers with a uniform, blemish-free finish.

An important foreign customer of a New England paper equipment manufacturer reported corrosion and pitting on its dryer rolls during transportation overseas. A regrinding operation was necessary before the rolls could be put in service. Effective protection against corrosion had to be found!

A Gulf Lubrication Engineer was consulted and his recommendations were followed to the letter. Result: corrosion entirely eliminated, regrinding costs saved, the customer completely satisfied!

Here are the suggestions made by the Gulf Lubrication Engineer: (1) clean surface with Gulf Stoddard Solvent; (2) apply Gulf No-Rust C (Polar type) to displace residual moisture; and (3) coat with Gulf No-Rust No. 3 to provide heavy protecting film against corrosion during overseas shipment.

Gulf offers a complete line of oil- and petrolatum-type rust preventives from which you can select the proper coating to fit the desired method of application, type of metal, length of time for which protection is required, conditions of storage or shipment, and ease of removal. Write, wire, or phone your nearest Gulf office today and ask a Gulf Lubrication Engineer to call.

Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices:

Boston • New York • Philadelphia • Pittsburgh • Atlanta
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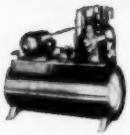
GULF INDUSTRIAL LUBRICATION

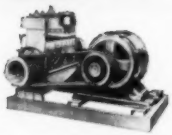
Helps make machines produce more at lower cost

CHOOSE THE COMBINATION SUITABLE FOR THE JOB!

There's a Schramm Size for every Requirement

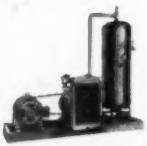


SMALL INDUSTRIAL COMPRESSORS... from ¾ to 5 H.P. single or two stage with horizontal or vertical tanks, working pressures, single stage up to 150 pounds and two stage up to 200 pounds pressure.



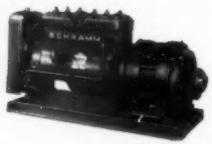
"V" BELT DRIVE ON BASE WITH MOTOR ... this type assembly has proved very popular because it permits the use of the most advantageous operating speeds where only odd frequencies and voltages are available.

MODEL 50 "BUILT-IN" MOTOR DRIVE... the overhead tank unit is only one of the many models and combinations of this small compact industrial compressor that can be bolted direct to any substantial floor.

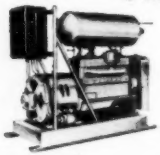


COMPLETE WITH VERTICAL TANK AND COOLING UNIT... a package that simplifies installation. Compressor is mounted complete with motor, vertical tank and cooling unit on base that can be bolted to any solid foundation.

HEAVY DUTY "V" BELT DRIVE... built in sizes ranging from 157 to 609 cubic feet displacement, suitable for service twenty-four hours per day with the lowest up-keep and operating costs.



DIRECT MOTOR DRIVE WITH COOLING UNIT... the built-in type utilizes to the fullest extent the efficiency of motor and compressor. No external flywheels or pulleys, no vibration and no bolts to adjust.



OVERHEAD TANK, STARTER AND COOLING UNIT... the advantages of this type of installation are, the absence of any external parts, no belts to be maintained, or to be replaced when worn out, small floor space required. This unit is practically vibrationless in operation, and can be placed and operated on any floor of sufficient strength to carry the load, no foundation is required.

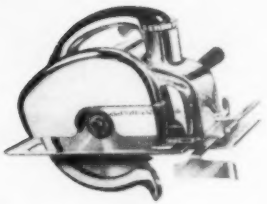
WRITE FOR BULLETIN 4810

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PA.

in five sizes, with AGA output ranging from 172,000 to 68,000 B.t.u. per hour. Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21.

•



Electric Saw

Portable electric saw has an 8½-in. blade and is equipped with 2⅛-hp. motor for cutting wood, sheet metal, stone, tile, or composition. Manufacturer states that tool, which weighs 19½ pounds, is balanced for one-hand operation. A balanced torque principle, in which the motor and saw blade turn in opposite directions, keeps the saw from jolting or twisting when starting. Hard aluminum alloy base measures 6¾x15⅝ inches. Triple acme lead thread makes it possible to adjust the blade without variations after it has been set for angles from zero to 50 degrees. Standard equipment includes metal carrying case, wrench for removing saw blades, and a combination rip and cross-cut blade. Other blades available include cross-cut, rip, abrasive cut-off, and diamond wheel. American Floor Surfacing Machine Co., 539 S. St. Clair St., Toledo 4.

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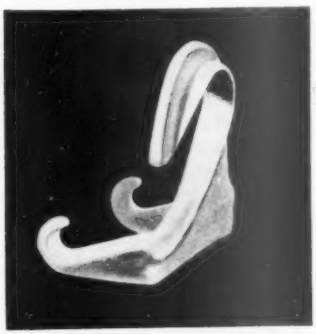


Ladder Hook for Pails

Cast aluminum hook for holding pails fits over rung and around side of the ladder. Pail hung in this manner is held securely and cannot swing. Beauideal, Inc., 821 S. Water St., Saginaw, Mich.

•

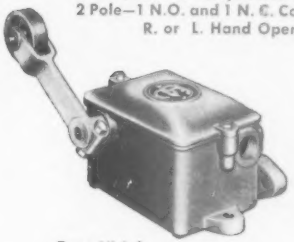
Vertical Speed Reducer

Lightweight vertical speed reducer features low headroom requirements. It uses stock parts, will provide any driven speed below 154 r.p.m., and is built to mount on the

CLARK HATCHWAY LIMIT SWITCHES for HEAVY-DUTY APPLICATIONS

Type HLA-3, 2 Pole—1 N. O. and 1 N. C. Contact; R. or L. Hand Operation; Open View

Type HLA-1, with Special Arm on 7" Phenolic Composition Roller; 2 Pole—1 N.O. and 1 N. C. Contact; R. or L. Hand Operation.

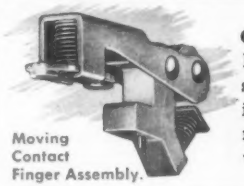


Type HLA-1, R. or L. Hand Operation; 2 Pole—1 N.O. and 1 N.C. Contact.

CLARK Bulletin 102 Hatchway Limit Switches are used as Pilot Circuit devices to limit travel or set up fuctions at predetermined positions. 1-, 2-, 3- and 4-pole types are available (see illustrations at right)—with a wide variety of contact arrangements. For convenience, mounting feet are provided on the side as well as on the bottom of the case. Flanges on the bottom prevent rocking and provide a solid base.

Weatherproof enclosures are standard on 1, 2 and 3-pole types. *Water-tight* is standard on 4-pole, and available for others. *Dust-tight* can be provided for all types.

Type HLA-44; Water Tight Enclosure, Right Hand Operation only; 4 Pole—any Contact arrangement.



Moving Contact Finger Assembly.

Contact Finger assembly is the same as in all CLARK Bulletin 102 Limit Switches, thus simplifying installation in plants having several types. Double-break alloy silver contacts require no dressing since oxidation will not cause poor contact. They may be removed by a simple twist with the fingers, and pressure spring will stay in position.

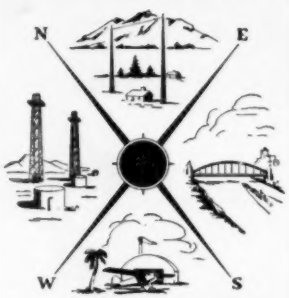
For Complete Information, Ask for Bulletin 102-HL.

EVERYTHING UNDER CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

IN EVERY CLIMATE



Hot-Dip Galvanizing Provides the UTMOST in Rust Prevention!

In every part of the world—wherever exposed installations and equipment of iron or steel must render dependable uninterrupted daily duty—Hot-Dip Galvanizing through cumulative evidence and the test of time has convincingly proved its superiority as a rust preventive.

Alloys Base Metal With Molten Zinc

Only the Hot-Dip Galvanizing Process *actually alloys* protective molten zinc to the base metal, sealing in iron and steel against the ravages of rust and corrosion.

Billions of dollars are being saved every year through the wisdom that specifies: "Hot-Dip Galvanize," and the foresight that designates a member of the American Hot Dip Galvanizers Association to provide this utmost in rust prevention service.

Write for Membership Roster

For membership roster or any information in regard to *your* particular corrosion problems, address The Secretary, American Hot Dip Galvanizers Association, Inc., First National Bank Bldg., Pittsburgh, Pa.

hot-dip GALVANIZING

shaft of the driven machine, with no supports or special foundations needed. Pulleys or sheaves of different diameters may be substituted in the primary belt drive for speed changes, or standard adjustable-diameter sheaves may be used. Interchangeable bushings permit its use on shafts of various sizes. The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29.

•

Band Saw

General-purpose band saw, Model 36-L, is suitable for high-speed band sawing of wood or sheet metal. It utilizes narrow hard-tooth flexible-back Buttress blades, which require no resharpening, or spring temper blades up to 2 inches in width. For fine work, blades as narrow as ¼ inch may be used, permitting the sawing of a ⅝-in. radius. Unit has 36-in. throat and 20-in. maximum thickness capacity. The main work-table is 30x36 inches, with hand-wheel-operated table tilt 45 degrees to right and 5 degrees left. Auxiliary table is 19x19 inches. The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

•

Unit-Cooled d.c. Motors

Totally-enclosed unit-cooled d.c. motors in ratings up to 200 horsepower are constructed with a cooling assembly, said to enable them to operate at slow speeds for long periods of time. Two blowers in the air-to-air cooling assembly, driven by a single induction motor, provide ven-

FOR SAFETY PLUS

For *better* rubberized Work Gloves, look for the HOOD Trade Mark — a sign of quality since 1896. Styles to suit every requirement. Send for folder. Order from your jobber.

HOOD

HOOD RUBBER CO., WATERTOWN, MASS.
A Division of the B. F. Goodrich Company

LOCK JAW
Stops SHIMMYING
BUCKLING
YAWING
Model "B"
All-purpose work clamps
NOW in two sizes
Set-ups stay put when Lock Jaw grips with both downwards and sideways pressure . . . grip is sure, powerful, self-locking . . . eliminates cumbersome bolting and clampings . . . saves time and work spoilage. Use Lock Jaw on planers, radial drills, shapers, milling machines, surface grinders, boring mills and lathes.
Two sizes: Model B for large tables; New, lighter Model A where table space is limited. Interchangeable jaws to fit work contours.
Write today for Bulletin 140-A
Model "A"
RIVETT
RIVETT LATHE & GRINDER, INC.
BRIGHTON · BOSTON · MASSACHUSETTS · U. S. A.

Never omit the "Composite Valve" — in any cost-wise planning

CALL IT THE "COMPOSITE VALVE"—the giant that would result if *all* the valves in a plant were *one* valve. As pictured here, its proportion to other equipment in this detailed model of an automobile factory is fairly accurate. Representing your total valve investment, its size may surprise you, but it must be considered in any plan for economical plant operation.

IT PAYS to keep *your* "composite valve" in mind at all times . . . and thus avoid the common error of dismissing valves as a comparatively unimportant investment. With wages and material costs the highest ever, your total valve expense warrants the same careful attention that you give to operating costs of larger plant units.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but multiplied by thousands, it is a serious drain on operating budgets. JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering for lowest valve costs in the long run. Sold through leading Industrial Distributors.

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Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

"PRACTICAL PIPING LAYOUTS" is a 32-page book containing diagrams and descriptions of 25 basic piping layouts with complete recommendations for valve selection and location in the lines. Tells you "which valve where for best performance". FREE on request. Write JENKINS BROS., 80 White Street, New York 13, N. Y.

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Types, Sizes, Pressures, Metals for Every Need

"CARRYING"
..is part of school-day romance ..but it costs you money in manufacturing

"CARRYING" commodities to and from production, assembly, processing or packaging lines costs too much. It's a waste of time and manpower.

Put conveyors to work "carrying" — packages, parts, units — loose or in containers — up, down, or acrossthrough manufacturing or processing to storage or shipping. Speed handling operations—save time and costs.

The range, versatility, and flexibility of Standard Conveyors have been developed in more than 40 years of service to businesss and industry. See Standard for any conveyor need.

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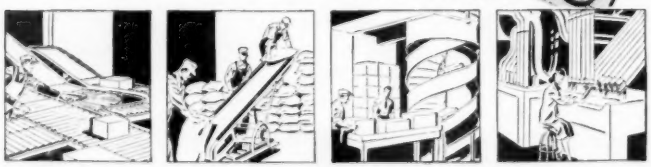

ROLLER - BELT - SLAT - CHAIN CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

tilation independent of motor speed. One circulates internal air through the motor and unit cooler, the other blows external air through the cooler. This is said to make full torque possible down to almost zero speed. Designed for operation in dusty, dirty, and oil-laden atmospheres, they require no piping, duct-work, air filter, or pressurized air supply. Large Motor & Generator Div., General Electric Co., Schenectady 5, N. Y.

•

Extension Scaffold

Six-foot scaffold ladder, called Hi-Lift, may be extended to 20 feet, and occupies a floor space as small as 29x54 inches. It is equipped with roller-bearing swivel casters on all four legs for maneuvering into tight places, and may be operated by one man. Atlas Industrial Corp., 849 39th St. Brooklyn 32, N.Y.

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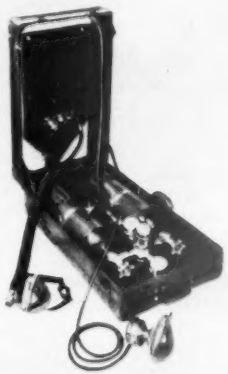
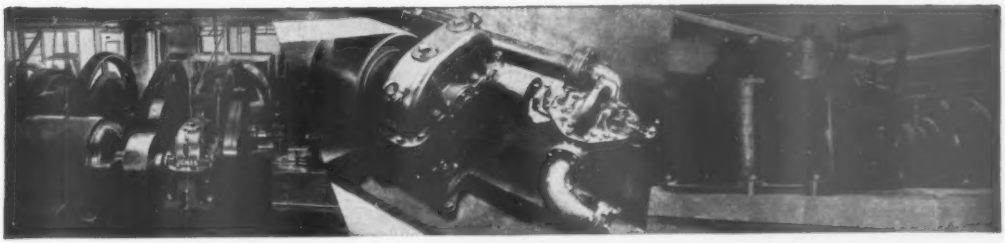
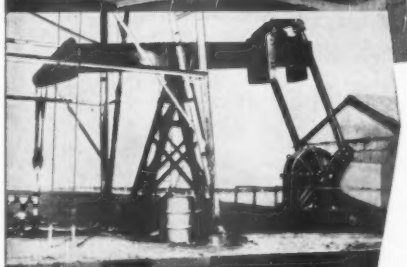


Resuscitator

Built into a standard inhalator to conserve space and weight, "Midget" resuscitator is intended for use in cases of asphyxia. In operation it



JONES DRIVES FOR INDUSTRY



★ For many years the W. A. Jones Foundry & Machine Company has been called upon as a consultant, to help solve a great variety of difficult drives involving the use of speed reducers, gears and other transmission machinery. In many cases these installations have called for the development of special equipment, designed and built to suit the specific requirements of the project.

As a result of these years of experience, involving numerous special problems in the mechanical transmission of power, the Jones organization has collected a vast amount of technical data relating to work in various fields.

Specific bulletins and catalogs are available on the products listed below and a general 20 page bulletin "Jones Drives for Industry" presents a broad picture of Jones products, engineering services and manufacturing facilities.

W. A. JONES FOUNDRY & MACHINE CO.
4433 Roosevelt Road, Chicago 24, Illinois

JUST ASK FOR BULLETIN NO. 80 ➡

● These illustrations show application of Jones drives to solve a wide range of industrial power transmission problems.

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HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS ● CUT AND MOULDED TOOTH GEARS ● PULLEYS
ANTI-FRICTION PILLOW BLOCKS ● V-BELT SHEAVES ● FRICTION CLUTCHES ● TRANSMISSION APPLIANCES

"Fastens quicker than lightning"

says JOE RAMSETTER

Slash fastening time and costs—set steel pins and studs instantly into steel or concrete with RAMSET SYSTEM

In 30 seconds, from start to finish, you can "nail" wood, steel and other hard materials to steel or concrete. You can set threaded studs for an endless variety of fastening jobs.

Cut costs! Users show savings up to 60% in time and materials over old-fashioned methods.

Save time! Get your work finished amazingly faster. Avoid costly delays caused by time-consuming drilling and plugging.

Easy to use! Light, compact RAMSET TOOL requires no electric or air lines—it's self-powered. Any good workman can learn "Ramsetting" in 30 minutes—and can set up to 50 fastenings in an hour.

Get details! Ask for 15-minute demonstration of how RAMSET SYSTEM can save you time and money—get your work completed faster, more profitably. Use the coupon.

Ramset FASTENING SYSTEM

Stemco Corporation, Cleveland 16 (Rocky River), Ohio.

In Canada—Globe Machine Tools, Batawa, Ontario.

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Stemco Corporation,
Cleveland 16 (Rocky River), Ohio

Please send details and arrange 15-minute demonstration of RAMSET FASTENING SYSTEM. No obligation, of course.

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introduces oxygen into the lungs, then draws it out as in normal breathing. Manufacturer states that it mixes air with the oxygen, adjusts the rate of breathing, and aids blood circulation to assist recovery from respiratory arrest. The device works independently of the inhalator, and starts functioning immediately upon being plugged into the coupling. A relief valve protects against excessive pressure, and oxygen content may be adjusted from 100 to 25 per cent. An airway is incorporated into the unit to keep the throat clear; throat clogging is signaled by rapid tripping of the resuscitator. Davis Emergency Equipment Co., 45 Halleck St., Newark 4, N. J.

•

Hose Connection

Detachable connection will shut off fluids and air under pressure when the hose connection is broken, and restore the flow instantly when connection is re-established. Has bayonet-type joint and a coupling that will not squirt when connection is made or broken, according to manufacturer. Binks Mfg. Co., 3122 Carroll Ave., Chicago 12.

•

Electric Soldering Pliers

Designed to eliminate "cold joints," electric soldering pliers are said to provide instantaneous heat without tinning, heat elements, or tips. Intended for wiring and soldering, manufacturer states that they are especially adaptable to compact assemblies. In operation, wires or parts to be soldered are held by the pliers, and the foot switch depressed. This heats the wires or parts sufficiently to melt the solder, using the current-resistance principle which heats the work only at the point of contact. Suitable for use on copper wire from 14 to 30 gage, device can also be used to silver braze small metal parts. Durst Mfg. Co., 11110 Cumpston St., No. Hollywood, Cal.

•

Vibration Dampener

Waffle-like surface of rubber vibration dampeners, called Shock Stops, provides a semi-pneumatic action said to isolate vibrations set up by most types of motorized equipment. When placed between base of

GIVING BELTS THE HOTFOOT

. . . FOR A LONGER LIFE

QUAKER CONVEYOR BELTS PRE-TESTED 18 TIMES TO ASSURE LONG LIFE UNDER MOST SEVERE CONDITIONS

Coal . . . cinders . . . hot ashes . . . packages . . . products on the line—Quaker Belts are made for every purpose and case histories prove they stand up under the most severe usage. They're pre-tested and torture-tested when they are made to withstand every operating condition.

One of the many tests Quaker Conveyor Belts must go through is shown above. A blowtorch, at high heat, held six inches from the surface of the belt for six minutes. Quaker Belts take it and are ready for more. They're tough, rugged and built for long wear. They're made for every industrial application to assure less maintenance . . . to help your plant reduce the "break-even point" in its operations.

Whatever your need for industrial rubber products there's a Quaker Pre-tested Product for your plant. Power transmission belting for every type of installation . . . rod and sheet packings . . . moulded and braided hose . . . and all kinds of custom-made moulded rubber products. To economize on production costs . . . it pays to Quakerize your plant.

HOSE THAT STANDS ABRASION

Hose for air, steam, water, oil, gas, chemical, fire, or paint, Quaker makes it and makes it to fit the particular needs of industry . . . each length pre-tested for peak performance.

PACKINGS FOR TIGHTER SEALS

Quaker Packings are scientifically engineered for every use—for pumps, refrigeration, compressors, water lines, valves and many other places in industry. Each pre-tested for positive performance.

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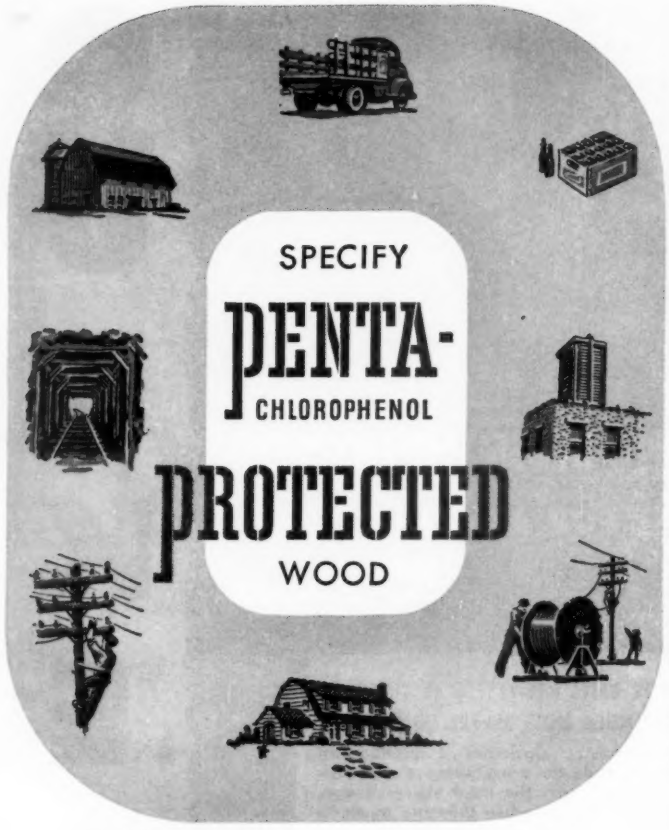

Wherever wood is used it will pay you to consider the advantages of PENTA-protected wood.

"PENTA"-protected wood means lower building costs, fewer maintenance worries and longer life for wood structures.

Widely used in home, farm and industrial construction, PENTAchlorophenol is rapidly revealing new uses for wood—the *economical* building material. It effectively protects wood from termites and decay. Wood that is "PENTA"-treated is clean and easy to handle . . . paintable too, when the proper solvent is used.

Safeguard *your* wood construction and *your* budget—specify "PENTA"-treated lumber. For additional information write Dow, Dept. PE 55.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Specify lumber that's
PENTA-PROTECTED
CHLOROPHENOL
against decay and termites

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equipment and floor of the building, they protect floors, walls, and ceilings from damage and reduce noise, according to manufacturer. They are also useful in protecting balances, electronic devices, and similar delicate equipment from vibrations coming in from the outside. Available in 18x18-in. square sheets and in round shapes 3¼ inches and 2¼ inches in diameter. The Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.

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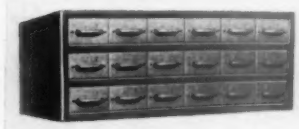

Small Parts Drawer Cabinets

Two steel drawer cabinets, designed to hold small hardware items, plumbing supplies, electrical parts, or other small pieces, may be used singly, side-by-side, back-to-back, or stacked. Frames are welded into one solid assembly. Drawers have adjustable cross dividers on 1-in. centers. Lengthwise dividers may be added or removed at will. Each drawer and divider is furnished with label holders. Model 11 has 18 drawers, each with three cross dividers, making 72 adjustable compartments. Its over-all size is 34x13¾ x12 inches. Model 8 has 8 drawers, each with two cross dividers, to make 24 compartments. Over-all size is 25½x10x12 inches. Drawer size of both models is 11⅞x3⅜x3⅛ inches. Equipto Div., Aurora Equipto Co., Aurora, Ill.

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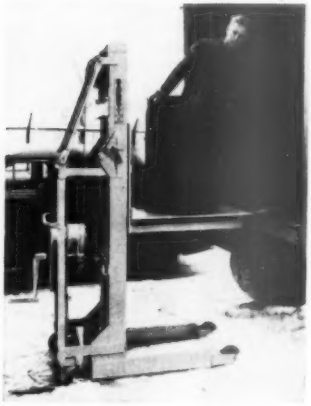
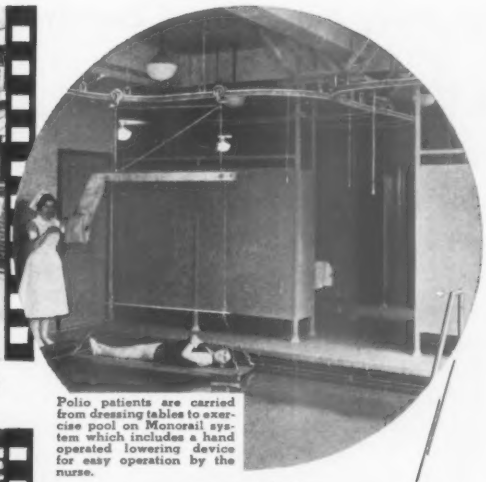


Portable Elevators

Line of general-purpose hand-operated portable elevators in capacities of 500, 1000, and 2000 pounds, are designed for loading and stacking, as well as for die handling, servicing balconies, and overhead repairs. Over-all height of the 500-lb. model is six feet; lift, five feet;

Another demonstration of the MonoTractor drive includes a swinging jib for passage of the carrier over a truck for removal of 2 ton bundles of sheet steel. An electric hoist and a Windsor sheet grab are used.



Polio patients are carried from dressing tables to exercise pool on Monorail system which includes a hand operated lowering device for easy operation by the nurse.

This twin-bridge 5 ton crane is 160 feet long operating on 9 runways. Two carriers, each centered between a pair of crane trucks, can make a lift of 10 tons as shown.

Fruit, unloaded from cars on special trolley racks, rolls around MonoRail curve to a drop section where the racks are lowered to basement tracks. The racks then roll by gravity to ripening rooms.

Try

UP AND OVER HANDLING

before you decide upon any material handling equipment....

Our 16 mm black and white twenty minute sound picture will bring to you the complete story of American MonoRail overhead handling. If you are in the market for any material handling equipment, see our movie first. We will gladly loan you the film for showing in your offices at a time most suited to your convenience. Please drop us a line.

*UP and OVER is the title of our 20 minute 16 mm sound film.

THE AMERICAN MONORAIL COMPANY

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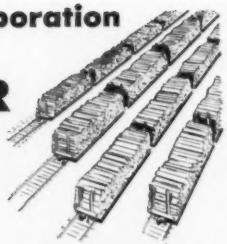
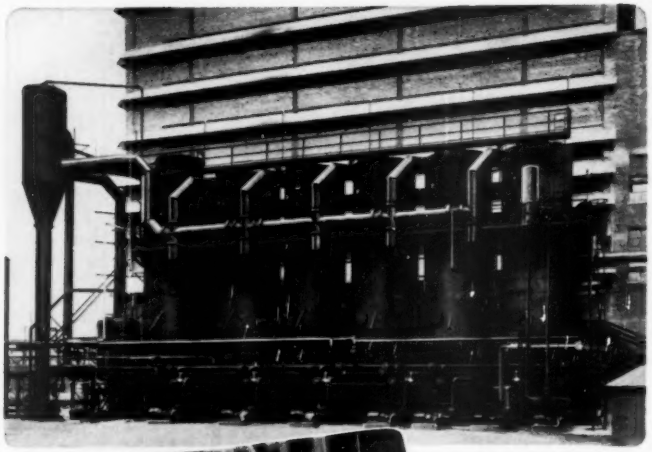
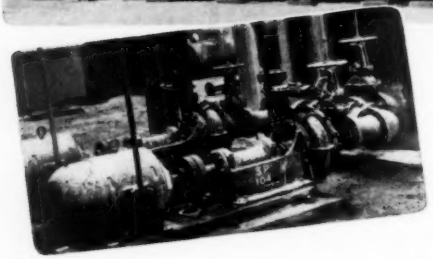
Southern Paperboard Corporation Selects

LUNKENHEIMER VALVES

for Port Wentworth Mill







Sextuple evaporator furnished by General American Transportation Corporation. Lunkenheimer Valves in caustic lines.

Lunkenheimer Valves in pumping operation on black liquor tank.

IN THIS outstanding new plant, as in many of the nation's other paper mills, LUNKENHEIMER Valves were selected for tough jobs. Producing an average of 450 tons of liner-board and similar products per day, a minimum of ten million gallons of water are used every 24 hours.

For the lines handling caustic and alkaline liquors (black, green and white), "CAUSUL" Metal Gate Valves were specified by the engineers, J. E. Sirrine Company of Greenville, S. C.

In other parts of this giant plant, Iron Body Gate Valves and "Ferrenewo" Valves were used where bronze valves did not meet requirements. Numerous other LUNKENHEIMER Valves, including "King-Clip" and Hose Gate were installed.

Selected for applications in many industrial fields, "CAUSUL" Metal Valves handle close to 100 corrosive solutions ranging from Acetic Anhydride to Zeolite and including acids, solvents, alkalis, alcohols, food products, brines, and wastes.

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maintains adequate stocks for your needs. Ask him for Circular No. 592 which gives complete details on "CAUSUL" Metal Valves, and for confidential information blank from which definite recommendation for your corrosive service can be prepared. Other descriptive literature also available.

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24-inch-square platform is 5¾ inches from floor when lowered. The 1000-lb. elevator is equipped with a hand mechanism with two speeds up and governor down. Over-all height is 8 feet; lift, 6 feet, 4 inches; hinge height, 5 feet, 6 inches; platform, 24x30 inches. The over-all height and hinge height of the heavy-duty 2000-lb. model are the same as the 1000-lb. unit, with a lift of 5 feet, 8 inches, and a platform measuring 24x36 inches. Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9.

•

Paint-Spray Unit

Lightweight portable paint-spray unit, Model DP, weighs 47 pounds, delivers 40 pounds working pressure, plugs into any 110/120-volt a.c. line. The compressor measures 15⅞x 11½x7½ inches. Device will handle paints, lacquers, and other coatings. There are no exposed moving parts; motor has a safety cut-out overload switch; over-size fins cool the compressor. Binks Mfg. Co., 3122 Carroll Ave., Chicago 12.

•

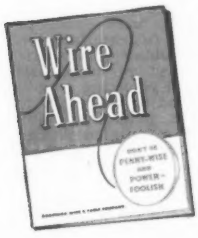
Paving Breaker

Intended for demolition work, paving breaker, Model B37, weighs 38 pounds. Features include a renewable chuck liner and a block pistol-type reversible hammer. The use of a tappet, which operates in a renewable bushing, is said to mini-

But what about the DISAPPEARING ACT *in your plant?*

You might be even more mystified to discover just how much of the electric power you pay for isn't there when it gets to the machines. It's the black magic of overloaded, over-extended, obsolete wiring* that slows down motors and men.

Your plant power engineer, consulting engineer, electrical contractor or utility power salesman knows how to materialize your vanished power. Better ask . . . *soon.*

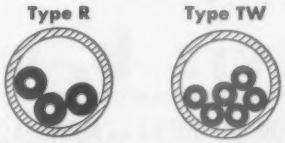


***WIRE AHEAD** . . . a comprehensive discussion of preventive maintenance, points out the symptoms of inadequate wiring, presents detailed plans for anticipating electrical demand. Forty-eight factual pages of practical information and suggestions free on request.

Densheath Type TW Building Wire with its special thermoplastic insulation is sound production insurance in any plant. It will not support combustion, is long-aging, impervious to acids, oils and alkalis. It is recognized by the National Electrical Code for circuits up to 600 volts and temperatures up to 140° F. . . . and for wet and oily locations. Being light weight, with a smooth, slick finish and without braid, Densheath pulls through easier . . . resists abrasion. Permanent, bright colors for quick circuit identification. Write for literature.

This is important, too—*for rewiring in existing raceways,* the Code recognizes the smaller diameter of Densheath TW and permits more conductors to be pulled in the same size conduit. Below, a typical case—

½" CONDUIT



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Webb Overhead Conveyors . . . Continuous or Power and Free . . . put the unused half to work. Production is increased, smoothed and automatically programmed. Productivity is improved. Valuable floor space is released for manufacturing. Live storage banks are provided off the floor, out of the way. Frequently, parts produced on two or three shifts are banked for assembly consumption on one shift. The right parts are fed to the right place at the right time.

Jervis B. Webb Company builds every type of conveyor as well as Overhead. There is a combination that will save you more. Let us plan with you. Our 30 years' experience qualifies us to handle any job. 5176

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mize wear on the hammer striking face. Tool is provided with a valve lock similar to a "safety" on a gun, intended to minimize accidents. Manufacturer states that exhaust will not freeze, and that the latch-type steel retainer holds the tool securely, permitting fast cutting action without violent recoil. Gardner-Denver Co., 100 Williamson St., Quincy, Ill.

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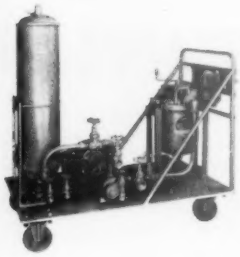

Transfer Unit and Filter

Portable transfer unit can also be used for the filtration of fluids. Mounted on truck with electrically driven pump are a metal-edged strainer and micronic-type filters. Valves are so arranged that in the process of transfer of fluids, one, both, or neither of the filters can be used. Suitable for cleaning paint, coolant, kerosene, solvents, hydraulic and lube oils, and similar liquids. Available in capacities ranging from 5 to 80 g.p.m., unit can be supplied with suction and discharge hose assemblies. J. N. Fauver Co., Inc., 49 W. Hancock Ave., Detroit 1.

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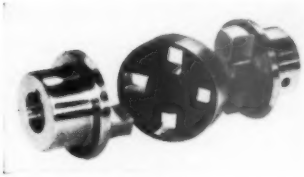

Flexible Coupling

Articulated flexible coupling is designed to carry heavy loads under severe operating conditions without thrust on the driver or driven, and without distortion, back lash, or chatter, according to manufacturer. Large synthetic rubber spider provides shock absorption and resists high torque. Steel retaining ring is molded and bonded to the spider to prevent distortion, to dissipate any heat generated by misalignment, and to permit operation at high speed without damage from torque and centrifugal force. The coupling is said to compensate for parallel and angular misalignment. Estey Co., 547 N. Main St., Canandaigua, N. Y.

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Lubricant

Ball and roller bearing grease, called G-66 Stability Tested, was de-

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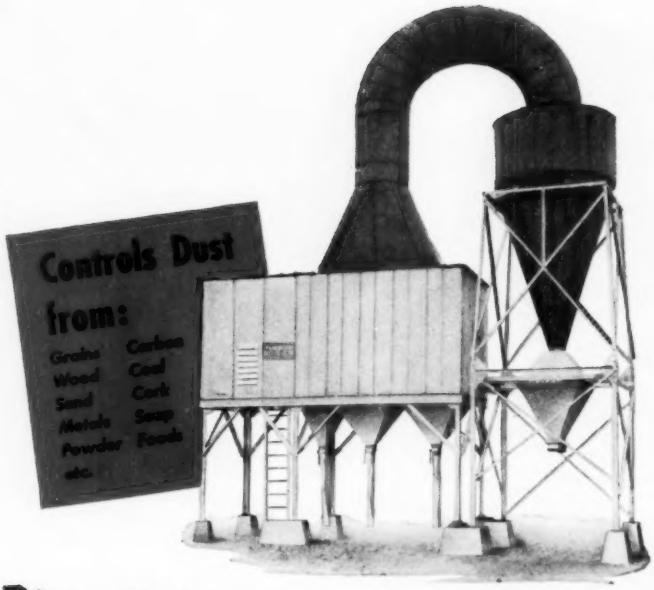

You can

ELIMINATE DUST

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RIGHT—you can eliminate dust problems in your plant and earn a profit at the same time with Pangborn Dust Control. Pangborn removes dust from working areas, protects employees, safeguards raw materials, improves your product, boosts production, recovers valuable materials for re-sale or re-use. Pangborn systems really pay off!

Hundreds of Pangborn units in all types of industries are proof that Pangborn helps you make a profit out of dust problems. A metal specialties plant saves $8000 every year with Pangborn . . . a furniture factory reports over $6000 annual savings with Pangborn on the job . . . savings on materials salvage pays for two Pangborn units for soap maker . . . foundries claim efficient operation is practically impossible without Pangborn dust control.

FIND OUT ABOUT YOUR PLANT!

Skilled Pangborn engineers will make a *Dust Pocket Survey* of your plant at no cost to you. The survey may show you how you can save money and get rid of dust all at the same time! Write for complete information on Pangborn Dust Control, Bulletin 909A to, PANGBORN CORPORATION, 282 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

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DUST CONTROL

veloped to provide a stable lubricant suitable for use over a wide temperature range without separation, drying out, or hardening. It is resistant to oxidation, insoluble in water, will not emulsify or aerate in the presence of condensed moisture, according to maker. The Norma-Hoffman Bearings Corp., Stamford, Conn.

•

Bronze Sump Pump

All-bronze sump pump, Model SB-540, is equipped with a rustproof capacitor motor, a condenser, and a Cutler-Hammer float switch. The coupling is exposed to facilitate checking. Manufacturer states that construction is such that it will not interfere with radio or television reception. Weil Pump Co., 1528-38 N. Fremont St., Chicago 22.

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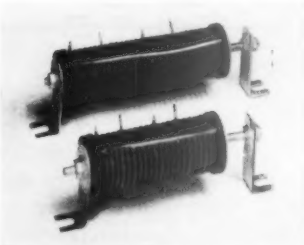


Selenium Rectifier Cell

High-voltage selenium rectifier cell designed to permit the use of a smaller stack to achieve the same wattage output is rated at 18 volts d.c. output. It is intended for installation where space is limited and where the stack will not be required to operate continuously for long periods. Uniform coating of selenium on each cell is said to result in uniform characteristics of operation in electrical equipment requiring d.c. power. General Electric Co., Lighting & Rectifier Div., Schenectady 5, N. Y.

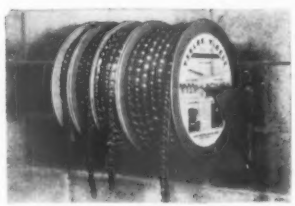
•

Water Conditioner

Made from pure food-grade phosphate, packaged in crystal form,

Here's how to cut your v-belt costs

You can replace up to 316 sizes of endless v-belts with just 4 reels of Veelos



From these four reels of Veelos you can make up 316 sizes of O, A, B and C section endless v-belts.

Any length belt can be coupled for quick installation on any drive in a few minutes.

Machine downtime is practically eliminated. Sliding or pivoted motor bases are not needed.

MAYBE you need belts of only one or two widths—but many different lengths—to keep all your drives producing. Then one or two reels of Veelos will give you a *complete* v-belt inventory.

You don't need to tie-up working capital in a heavy v-belt stock . . . you don't need to maintain costly inventory records. *With Veelos, you have the right size v-belt for any drive in your plant—all the time!*

Veelos on reels saves valuable storage space. It simplifies stock records; it eliminates belt deterioration and obsolescence.

Veelos is simple and easy to install. No need to dismantle drives with fixed centers or outboard bearings . . . no long, expensive interruptions to production. Just loop it around the sheave and couple the ends.

Check the advantages of Veelos and you'll agree that it can provide substantial savings for you.

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THE LINK
V-BELT

Everyone responsible for power transmission needs this Veelos data book. Gives complete engineering data, measuring and installation directions. Shows Veelos at work on scores of different drives in many different industries. Write and we'll send you a copy *free!*

MANHEIM MANUFACTURING & BELTING COMPANY
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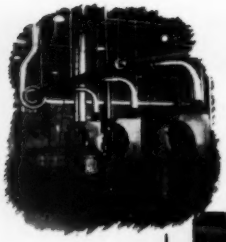
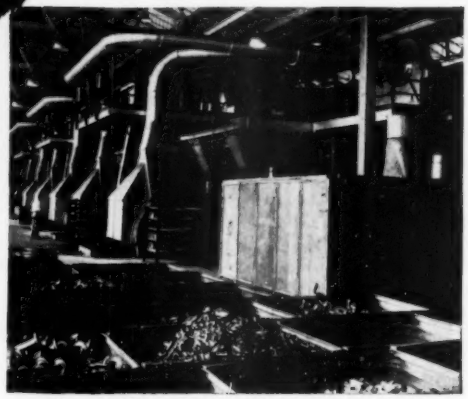
ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all standard sizes, fits all standard grooves. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. Veelos is known as VEELINK outside the United States.



48 ROTO-CLONES police dust here!



Three type W Roto-Clones serve these six foundry shakeouts at Memphis Works of International Harvester.

Memphis Works of International Harvester Employ 3 Types of Roto-Clones For Complete Foundry Dust Control

THEY even harvest the dust at International! Grinders (both portable and stand type), abrasive cleaners, sand handling equipment and shakeouts—all are serviced by AAF Roto-Clones*.

Three types of Roto-Clones—D, W, and N—exhausting a total of over 300,000 CFM are used in this modern Memphis foundry. Above you see a battery of portable grinders served by a compact Type D unit. At left is pictured a group of six foundry shakeouts whose dust load is handled by 3 Type W Roto-Clones.

Regardless of the nature or quantity of the dust generated in your plant, there's an AAF Roto-Clone of a type and size designed for highest collection efficiency—plus simplicity, compactness and low operating cost. The experience of engineering Roto-Clones to solve thousands of dust problems is yours for the asking. For complete information, call your nearby AAF representative or write direct to—

Get the Roto-Clone Story!
Bulletin No. 270-A describes the complete Roto-Clone line, its applications and advantages. Write for it now!

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AAF
ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trademark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

may be added to any water system by means of a feeder installed on the water inlet. Manufacturer states that substance is slowly soluble, and needs a monthly renewal of only 25 per cent of the initial charge. It is said to retard scale, rust, and corrosion, and to increase the amount of soft water supplied in a water softener operation. Bruner Corp., 2318 N. 30th St., Milwaukee 10.

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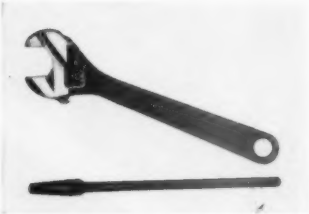

Adjustable Wrenches

Line of carbon steel adjustable wrenches have thin, tapered jaws and are made in sizes ranging from four to 18 inches, with capacities from ½ to 2 1/16 inches. They are drop forged and heat treated. Square shoulders on the shank portion of the sliding jaw provide maximum bearing against working stress, eliminate wedging and spreading action, according to manufacturer. J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y.

•

Nonmetallic Sheathed Cable

Covered with an outer coating called Glazon, construction of nonmetallic sheathed cable eliminates the individual wrapping of each wire. Instead of the customary 2/64-in. rubber insulation on smaller sizes (14 and 12), a 4/64th-in. coating is applied to the tinned copper conductors. This is said to facilitate preparation for stripping as well as to provide improved tensile and dielectric strength and resistance to moisture, impact, fungus, and deterioration. Suitable for 600-volt service, it is available with two or three conductors, solid or stranded, with or without ground wire, in sizes from No. 14 through No. 4. Triangle Conduit & Cable Co., Inc., 1918 Jersey Ave., New Brunswick, N. J.

•

Air- or Water-Operating Valve

Self-sealing air- or water-operating ball-type valve, known as Type BA-1, is fitted with a quick-opening lever adjustable to any horizontal position. Manufacturer states that the ball valve closes tight with inlet pressure and will not collect dirt or other foreign matter. Stem is sealed by an O-ring which is self-packed by

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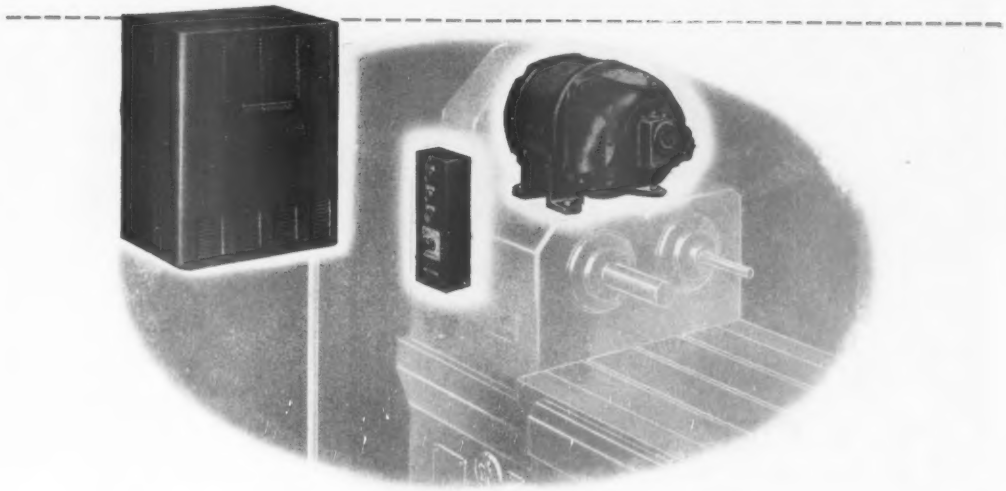

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. . . you'll find a helpful, profitable answer in Mot-O-Trol . . . the complete packaged drive for controlling d-c motors operated from a-c sources. The broad scope of Mot-O-Trol's functions explains its ability to give you top performance in many and diverse processes requiring precise, intelligent control. For example:

It starts the motor . . . brings it up to preset speeds smoothly and accurately. It regulates speed under varying loads and allows for wide changes of speed at any time. It limits current to protect against unsafe current peaks . . . to provide for smooth acceleration. It applies dynamic braking for smooth stopping.

You can use Mot-O-Trol wherever requirements call for strict maintenance of a set pattern of d-c motor performance. Heat-treating and dip processes, conveyors, grinding, cutting and milling machines, printing presses, feed drives and testing machines are only a few applications where Mot-O-Trol is helping to boost product quality and the speed and economy of its production. J-60695

Booklet B-4112, just off the press, describes every function . . . every advantage of this remarkable electronic control. To get your copy, call your nearest Westinghouse office or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

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the operating pressure when the valve is open, permitting flow. Suitable for use with air, water, and other fluids of a noncorrosive nature up to 200 p.s.i. and temperatures up to 150 degrees F. for air, 180 degrees for water. Constructed with cast semi-steel body, integral rubber seat insert, screwed connections, ½-in. size; can be bushed to ¼ or ⅜ inch. Leslie Co., 112 Delafield Ave., Lyndhurst, N. J.

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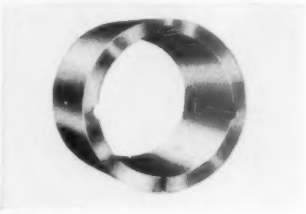

Bushing Adapter

For use with manufacturer's Taper-Lock bushings where it is more convenient to use a straight bore in the hub than to drill and taper-bore hubs, bushing adapters consist of a taper-bored sleeve which fits into the straight bore of the hub. In use, bushing is slipped inside the adapter, which is tapped to receive the bushing screw. In tightening the locking screws in the bushing, the adapter expands against the hub bore and contracts the bushing on the shaft. Dodge Mfg. Corp., Mishawaka, Ind.

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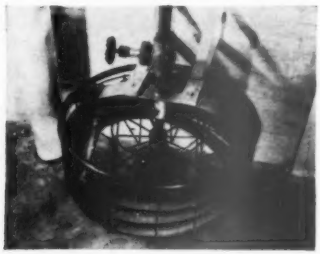

Hose Reel

Called the Water Boy Rollaway, reel is intended to be permanently attached to the ceiling or other out-of-the-way space, and to hold hose directly connected to the water supply line. Steel basket assembly holds the hose loosely coiled so that, when needed, it can be "walked out" for service at any required distance up to its own length. When the job is finished, the hose automatically recoils itself into the reel. May be used for steam or hot water hose as well as for regular water supply, and is useful where hose is used for flushing out boilers, tubs, vats, for cleaning, and for supplying water for process work. The Zierden Co., 3815 S. Kinnickinnic Ave., Milwaukee 7.

•

Protective Coating

Bakelite-reinforced base of protective coating, called Upcolastic, is

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No. 4 in a Series

Black and white bristle used for this photograph to emphasize the layers of bristle as they are laid out

What is the greatest test of skill for a bristle expert?

Formulating the bristle batch. Each kind and length of bristle has its own characteristic working qualities. Selecting and combining the various bristles require years of first-hand information and knowledge because the working qualities of the finished batch have to be pre-determined.

Fortified by a thorough knowledge of painters' needs and brush requirements, Pittsburgh's skilled bristle craftsmen have put into use over 2200 batch formulas! Every batch is designed for maximum efficiency and long life.

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Painting . . . Finest bristles go into Pittsburgh's Gold Stripe, Bristle-Neoceta and Nylon brushes. They're made to wear and wear! And for *real* economy in these days of rising costs, why not try a Bristle-Neoceta? You'll do your job faster, better!

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Increases employee efficiency at no cost to you!

Fresh Candy from Clean, Modern Dependable Univendors Gives "On the Job" Energy—Cuts Employee "Lost Time".

Now your employees can enjoy fresh quality candy at no loss in plant time! For UNIVENDORS may be conveniently placed in plant, office or washroom locations . . . handy for plant and office personnel alike.

UNIVENDORS are installed, serviced and stocked with the finest brand candy by UNIVENDOR operators . . . *at no cost to you.* There is nothing to buy . . . your UNIVENDOR operator owns the equipment he installs. What's more—your proceeds may be used advantageously for goodwill, plant recreation, employee benefits, etc.

UNIVENDOR means the best in modern vendors. We will be pleased to recommend your local UNIVENDOR operator and have him make a plant survey for you. There is no obligation.

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Customer simply turns selector either way to gum or mint desired — then pulls lower knob for merchandise.

Four selections.

Dual Coin and Change Maker *Takes nickels or dimes through a single coin insert . . . sells for 5c or 10c in any regular column.*

Stoner Mfg. Corp. 324 GALE ST., AURORA, ILLINOIS

said to provide resistance to acid and alkali fumes, dirt, smoke, moisture, and wide temperature changes. It adheres to wood, metal, masonry, and concrete, may be applied by spray or brush. Manufacturer states that one gallon covers 600 square feet, one coat. Upco Co., 4803 Lexington Ave., Cleveland 3.

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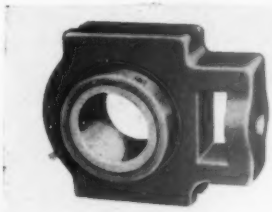


Take-Up Unit

Ball-bearing take-up unit, the Wide Slot SC model, consists of a deep groove precision bearing with large balls and retainer enclosed in an outer housing, with wide milled slots or ways on each end for supporting guides. Housing has a hole for receiving the unthreaded end of an adjusting screw. Unit is designed for conveyor and power transmission service where provision must be made for changes in shaft position. Dodge Mfg. Corp., Mishawaka, Ind.

•

Alkali-Resistant Enamels

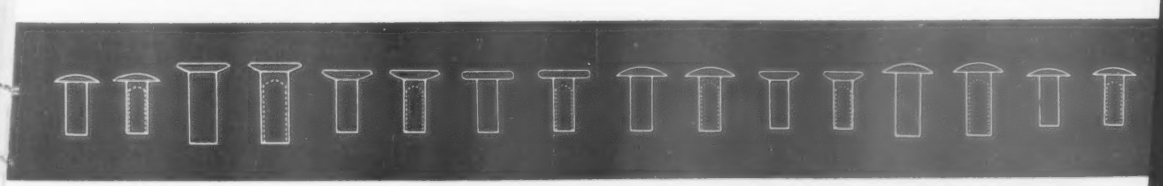
Rubber-base alkali-resistant floor enamels are intended for use on interior cement floors where dampness, alkali, or a combination of these elements is severe. Available in pewter gray and tile red. A solvent reducer, also used for removing wax and grease prior to painting, may be used as a thinner for the enamels and for cleaning brushes or spray equipment used in their application. Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh 22.

•

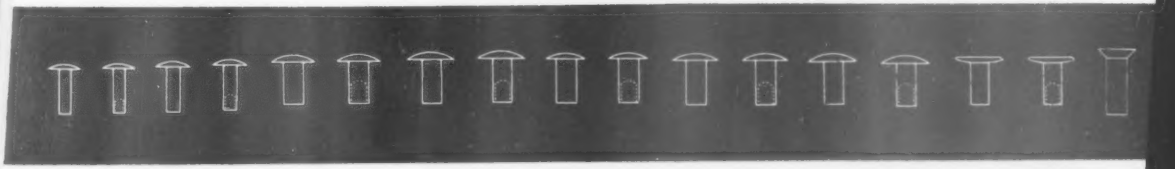
Television Equipment

Suitable for instructional purposes, or for remote viewing of hazardous processes, television camera chains, Models 1200A and 1200B, are designed for use with the Image Orthicon pickup tube. They can be

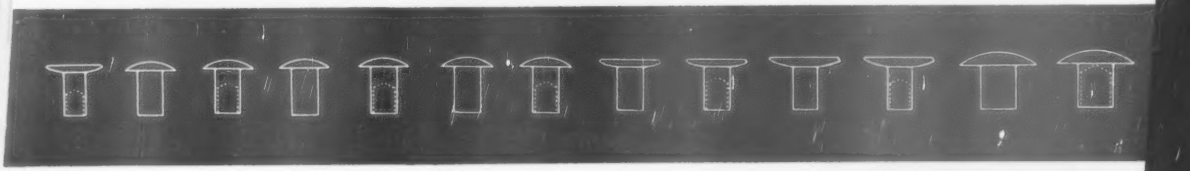
Your operations will flow smoothly when you use Townsend tubular rivets.



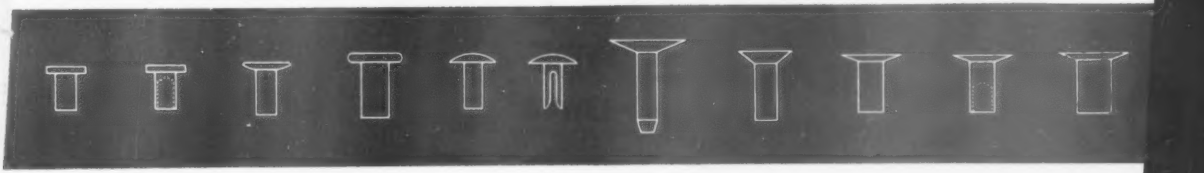
They have the uniform quality to work easily in your machines -- are



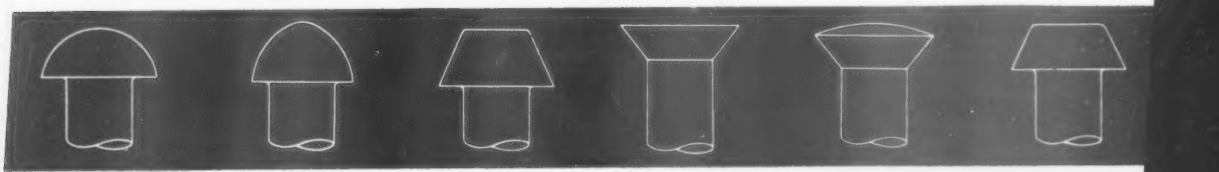
available extruded, also drilled -- in all metals and a variety of platings



and finishes. Townsend, the world's largest manufacturer of rivets, gives



you the benefit of 133 years experience in producing metal fasteners and



parts including an extensive line of both large and small solid rivets as

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COMPANY — ESTABLISHED 1816

well as tubular and split rivets. Write: New Brighton, Pa.
Chicago 38, Ill.

Get 3-Way Savings

with TRANSITE* PIPE for Industrial Water Lines

Searching for *sound* economies, many plant engineers have found they can effect these 3 important water line savings by using Transite Pipe:

1. Installation. You save with Transite because this asbestos-cement pipe is light in weight, easier to handle and install. The Simplex Couplings form tight, flexible joints that are quickly assembled in the trench even by inexperienced crews.

2. Operation. Transite Pipe has an initial high flow rate of C-140 that can never be reduced by tuberculation, the costly internal corrosion which chokes off carrying capacity. Transite's *maintained* high carrying capacity helps keep pumping costs low!

3. Maintenance. Transite Pipe is strong and durable. Made of asbestos and cement combined under great pressure into a tough, dense, homogeneous structure, this pipe resists corrosion *inside, outside,* and *all the way through.* Year after year, Transite Pipe provides efficient and economical service for water supply lines, fire lines and process lines of many types.

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TRANSITE PRESSURE PIPE

for Water Supply Lines • for Fire Lines • for Process Lines

made interlaced or noninterlaced as the application requires. By the addition of an rma.-type synchronizing-signal generator, the composite output signals can be made to conform to FCC standards. A 3-lens turret provides operational flexibility; up to 1000 feet of cable can be used between cameras and control equipments, and intercommunication between units is provided. Although basically a single-camera system employing only three fundamental units, it may be expanded to a 4-camera chain. Television Equipment Corp., 238 William St., New York 7.

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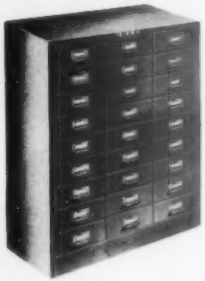

Drawer Cabinet

Available in either letter or legal size, 27-drawer cabinet is equipped with drawer dividers for making smaller compartments, can be locked. Letter-size model is 30 inches wide, 37½ inches high, 13½ inches deep. Legal size is 17½ inches deep. Cole Steel Equipment Co., Inc., 285 Madison Ave., New York 17.

•

Straddle-Type Lift Truck

Model 6-48 telescopic straddle-type lift truck will tier 48x48-in. pallets to the ceiling from 6-ft. aisles, according to maker. Called the Go-Getter, its capacity is 2500 pounds, length of load 48 inches. Collapsed heights are 68 and 83 inches; lifts, 85 and 115 inches. Also available in non-telescopic model with 83-in. fixed mast, 64-in. fork lift. Revolvator Co., No. Bergen, N. J.

•

Switches

Five different actuator designs of high-capacity switches have a steady-

FOR HIGH SPEED CUT-OFF BLADES... IT'S MO-MAX 5 to 3

A machine shop superintendent was satisfied when the cut-off blades on this job lasted 3 hours before regrinding. He was satisfied, that is, until he discovered that MO-MAX High Speed Ground Cut-off Blades lasted *5 hours* under identical conditions. MO-MAX is a molybdenum high speed steel with superior cutting qualities. Time after time it has proved its ability to cut faster, "stand up" longer, and reduce costs. A *Cleveland* Service Representative will be glad to give a demonstration in *your* plant, without cost or obligation. Ask our nearest Stockroom, or . . .

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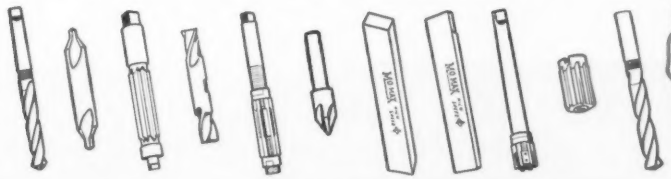

And, of course, management's most important responsibility is the promotion of *profits* through more efficient production and better control of costs . . . and that's where we come in.

General Engineered Shipping containers are lightweight, compact, extra-strong. They save packing and shipping costs. They are quickly and easily assembled. They save man-hours, help increase production. They are saving many firms substantial amounts month after month, year after year.

Let us show you how these same savings can be effected in your own business.

Our two Designing and Testing Laboratories are available for the improved packing of your products. They are equipped with the most modern testing apparatus and staffed by experts with many years of experience in designing more efficient shipping containers.

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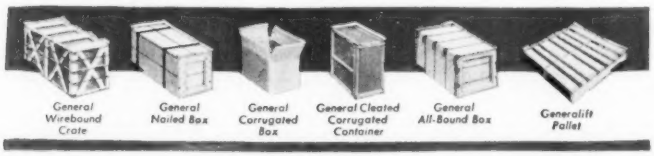

state current rating of 20 amperes, 125, 250, or 460 volts a.c.; motor-load rating of ¾ hp., 115 volts, 1½ hp., 230 volts; and a lamp load rating of 10 amperes, 125 volts a.c. Inrush capacity is 75 amperes at a.c. voltages up to 460. To insure switch operating at the same point in plunger movement throughout its life, actuators are attached to case cover. Micro Switch, Freeport, Ill.

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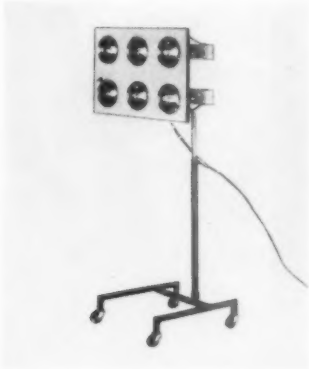


Heating and Drying Unit

Six-light infra-red portable heating and drying units are adjustable in height from 18 inches to 6 feet. They are mounted on four free-moving casters and may be tilted to any angle or swung in either vertical or horizontal position for concentrated heating and drying. Two or more units, each of which contain six inside-aluminumed, self-reflecting lamps, may be combined to form continuous banks. North American Electric Lamp Co., 1047 Tyler St., St. Louis, Mo.

•

Crate-Handling Attachment

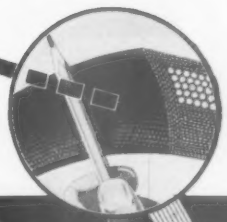
Attachment for handling fragile wooden crates, for use on manufacturer's Skylift electric trucks, uses a clamp device to grip the end slats of boxes. Crates may be picked up in either the vertical or horizontal position, lifted, carried, and tiered. Side-shifting device permits shifting the load 4 inches in either direction

This Simple Test
Shows Exactly How

The CONCAVE SIDE...

(U.S. Patent No. 1813698)

Saves You Money!



The Mark of SPECIALIZED Research

Pick up *any* V-belt having the ordinary straight sides and *bend* the belt. Three things will happen, right before your eyes.

(1) The top of the belt is under tension and grows *narrower*. (2) The body, under compression, becomes wider. (3) The sides of the belt *bulge out*. (Figures 1 and 1-A, below.)

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove

This bulging of the straight-sided V-belt in its sheave-groove costs you money in *two* ways—(1) The bulge causes uneven sidewall wear—*shorter life!* (2) The bulging side cannot evenly grip the wall of the sheave groove—a loss in *transmission efficiency!*

In figures 2 and 2-A, you see how the precisely engineered *concave* side of the Gates Vulco Rope exactly corrects this bulging.

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave-Groove.

Two distinct *savings* result. (1) The Gates Vulco Rope wears evenly—*longer life!* (2) The entire side-wall grips the pulley—carries heavier loads and *sudden load increases* without slippage:—saves *belts* and also *saves power!*

The Concave Side is *MORE IMPORTANT NOW* Than Ever Before

Because the sides of a V-Belt are what actually drive the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

498

GATES VULCO ROPE DRIVES
IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

"'Tain't fair—he's standing on slip-resistant 4-WAY Safety Plate!"

Yes, Inland 4-WAY Safety Plate provides superior slip-resistance—built-in *safety*. Install it wherever feet or wheels must go—on floors, steps, platforms—in your plant or on your product. Made of steel, it lasts for years. INLAND STEEL CO., 38 South Dearborn Street, Chicago 3, Illinois.

WRITE FOR BOOKLET

Inland 4-WAY* SAFETY PLATE

STOCKED BY LEADING STEEL WAREHOUSES

*Reg. U. S. Pat. Off.

from center to simplify load spotting. Hydraulic clamping arms, controlled by pushbuttons, are notched for various sizes of crates. Automatic Transportation Co., 149 W. 87th St., Chicago.

•

Float Switch

Intended for heavy-duty service, magnetic proximity float switch for liquid level control features standard or explosion-proof cover, forged steel body, stainless steel float, noncorrosive switch unit. Available for internal pressure ranges from vacuum to 600 p.s.i., temperatures to 700 degrees F., with higher pressure controls made on order. Known as Type H, they are suitable for use with liquids of 0.55 specific gravity and upwards, with units for fluids below this also available on order. Jo-Bell Products, Inc., 4840 S. St. Louis Ave., Chicago.

•

Air Valve

Called the Air-Saver, leakproof air valve is said to remove metal chips and other scrap material from machine tools. It may be mounted in any position to operate at any angle, and, it is claimed, is unaffected by machine vibration. Air volume is adequate for operation of multiple as well as single jets. Other applications include cleaning, drying, cooling, positioning, and ejecting. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

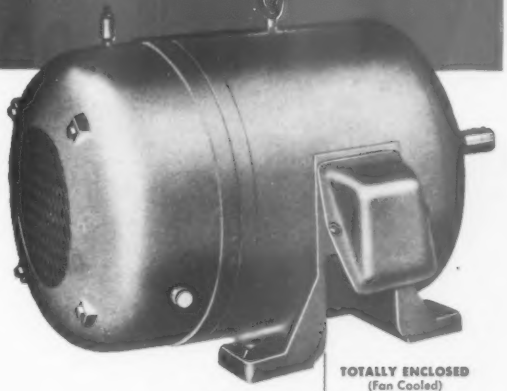
•

Hand Saws

Line of Bushman hand saws includes lengths of 18, 20, 24, and 26 inches, with regular and ship points, straight and skew backs. Blades are of Swedish polished charcoal alloy steel; teeth are universal type, fac-

NO OTHER MOTORS CAN MATCH THIS STAMINA STORY

How ELECTRO DYNAMIC met a tough challenge with superior WINDINGS



TOTALLY ENCLOSED
(Fan Cooled)

For use in dirt-laden atmospheres, especially where the installation requires a motor of compact dimensions.

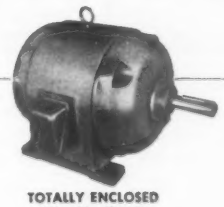
Fifty years ago, when the Electric Boat Company set out to be the world's largest builder of submarines, it determined also to produce the *world's toughest* electric motors (because motor failure on a submarine could mean death to the entire crew). Therefore, in 1899, Electric Boat acquired the Electro Dynamic Company to develop and build these extra-reliable motors.

The tremendous increase in the cruising range of the submarine, from a few hundred to *many thousands* of miles, presented a terrific challenge to its electric motors. As a result, Electro Dynamic *windings*—"the heart of the motor"—had to be toughened beyond anything previously conceived, to withstand additional gruelling months of sustained performance. So well did Electro Dynamic meet this challenge that, in addition to submarines, its *stout-hearted* motors have been installed on *over 50% of all American merchant ships* built since the war.

That is the story behind the new ELECTRO DYNAMIC *industrial motors*. Today, the same E.D. craftsmen that achieved greater stamina in marine motors are putting *extra care* and *superior materials* into the Electro Dynamic industrial line. Never before have motors of such high quality been offered at competitive prices! Write for illustrated literature today.

DRIP-PROOF MOTORS

For use under ordinary conditions not requiring protection from splashing liquids or dirt-laden atmosphere.



TOTALLY ENCLOSED
(Non-Ventilated)

For use in exceptionally dirty atmospheres, particularly when metallic dust is present.

SPLASH PROOF

For installation where the motor is subjected to splashing liquids or hosing down for cleaning.

Also a Complete Line of DIRECT CURRENT Motors and Generators. Literature on Request.

Industry is learning what marine engineers have known since 1880

ELECTRO DYNAMIC
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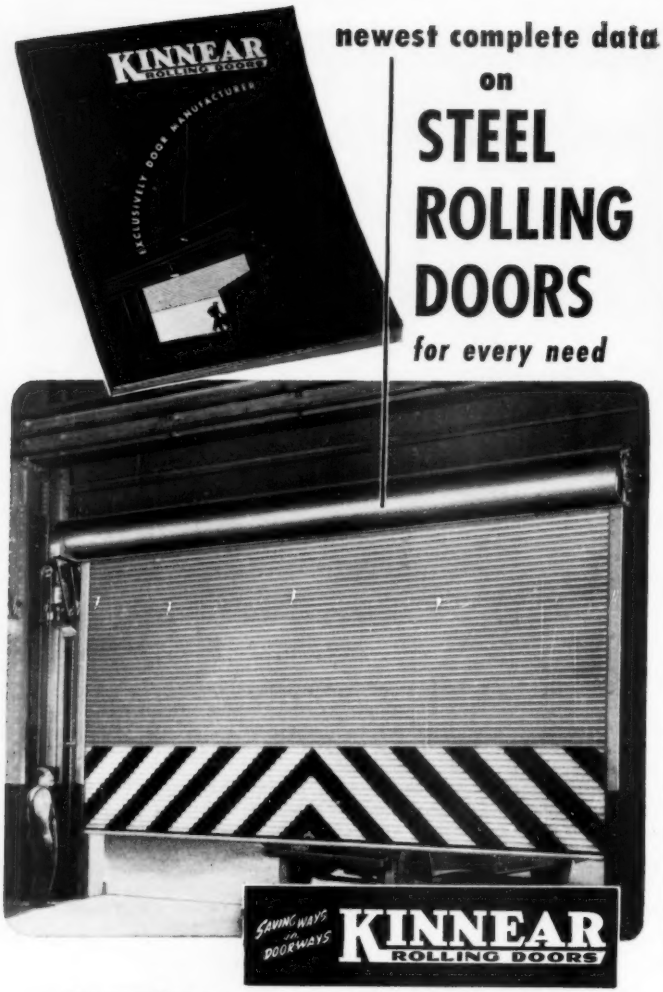

Complete information on smooth-working, space-saving doors for every need is at your fingertips in this new catalog. The easy upward action of Kinnear Rolling Doors brings time-saving efficiency to any doorway. The strong, all-metal, interlocking slat curtain opens completely out of the way, safe from damage . . . provides extra safety against fire, wind and intrusion when closed. Any size; motor or manual control. Full data on sectional-type upward acting doors is also included. If you haven't a Kinnear catalog for quick reference now, send for your free copy of this latest issue.

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tory filed and set. Handles are hard polished beechwood fastened with nickel-brass screws. Gensco Tool Div., General Steel Warehouse Co., Inc., 1830 N. Kostner Ave., Chicago.

•

Bucket Elevator

Bucket-type elevator of tubular steel construction is intended to transfer loose bulk materials, such as sand, gravel, or chemicals, at the rate of $1\frac{1}{2}$ to 2 tons per minute. Manufacturer states that no concrete pit is needed at the trackside when it is used, that the railbed is not disturbed, and that removal of the unloader during location or movement of hopper cars is unnecessary. Feeder unit may be installed between the rails and between two ties, is one-man operated, and may be transported in a small pick-up truck. Markroy Co., 6th & McCambridge, Madison, Ill.
61.

•

Thin Resistor

Wire-wound, vitreous-enameled thin-type resistor, one inch wide and one-quarter inch thick, is said to provide high wattage per unit of space and to be particularly useful when space is limited. Equipped with either a single-unit bracket for mounting close to the surface, or with a stud bracket to provide for stacking of two or more units. Manufacturer states that the resistors, with either kind of bracket, are made as fixed units and as adjustable lug units, with which odd resistances can be obtained. Lengths vary from $1\frac{1}{4}$ inches for the 30-watt size to 6 inches for the 75-watt. Five wattages are available in a wide range of resistance values. Ohmite Mfg. Co., 4837 Flournoy St., Chicago 44.
52.

•

Pipe Line Strainers

Series of pipe line strainers, for use on water, air, or gas lines, is made in three sizes, with $\frac{3}{8}$-in. I.P. tap inlet and outlet. Large screen area is said to remove rust, scale, dirt without effecting any noticeable drop in line pressure. The 80-mesh monel woven wire screens can be removed for cleaning without dis-

Specify Thermoid

The Thermoid Impregnation Process insures a deeper penetration of rubber between the threads of the yarn, which encases each individual strand with protective rubber. The rubber acts as a sheath between the strands and prevents the destructive abrasive action as the product is flexed in use. To obtain the required rubber penetration, the twist of the yarn must be to exact specifications. With the yarn twisted too tightly, proper penetration of the rubber compound is impossible. This condition produces abrasion, causing premature failure. On the other hand, if the yarn is twisted too loosely, the product lacks tensile strength. Thermoid has discovered the optimum twist of the yarn which assures maximum rubber penetration and greatest strength. The development of Thermoid Impregnation Process is another step forward in Thermoid's planned program of product improvement, assuring maximum service and lower operating costs to industry through the use of Thermoid Industrial Rubber Products.

Versicon Hose Cuts Costs

Now available . . . a multi-purpose hose designed for superior performance with virtually any liquid or gas . . . Thermoid Versicon Hose. It is made with neoprene tube and oil-resistant cover—with high tensile rayon cords to insure maximum strength, light-weight and flexibility.

Versicon, another of the famous quality rubber products made available to industry through Thermoid research, is the answer to a long felt need. Now your nearest Thermoid distributors can supply you with *one hose* for your requirements. Now you can cut your costs and reduce inventory. Versicon eliminates the need for special hose . . . Versicon *is* the special hose. Available from 3/16" to 2½" for use with air, water, oil, gases and virtually all fluids in lengths from 50′ to 500′ depending on size.

It will pay you to ***Specify*** Thermoid!

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

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Industrial Rubber Products • Friction Materials • Oil Field Products

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LUBRICATING
JOHNSON
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BEARINGS

NEW USES for these porous, oil-impregnated bearings are being discovered every month. They answer the long-felt need in applications where it is difficult or impossible to supply adequate lubrication. They may even be sealed in place. Johnson Ledaloyl Bearings can be used, too, for their low cost in many applications where heavy duty service is not a factor. Being molded under high pressure from powdered metal, they are much lower in cost than machined bearings, particularly in odd-shaped, flanged and self-aligning designs, and in large quantities of a size. You, too, may find practical uses for them and benefit from substantial savings.

JOHNSON engineers are glad to assist you in determining whether you can use Ledaloyl bearings to your advantage. Write today!

Ledaloyl BRONZE

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SLEEVE BEARING HEADQUARTERS
512 SOUTH MILL STREET • NEW CASTLE, PA.

turbing pipe connections. The screen in the No. 47 model, for air or gas, is packed with glass fiber to catch condensation from air or gas. Maid-O'Mist, Inc., 3217 N. Pulaski Rd., Chicago 41.

•

Heating, Cooling Coil

For use in plating, degreasing, pickling, and anodizing tanks, heating and cooling coil employs embossed metal plates permanently welded together. Called Platecoil, it features high Btu. capacity per square foot of area, rapid even heat transfer, small coil space, and low maintenance cost. Coils will fit practically every size and design of tank, according to manufacturer, who states that because of its generous passage for the heating or cooling agent and its high ratio of prime surface, unit develops a high rate of heat transfer. Available in two styles, and in three metals—cold rolled steel, stainless, and monel. The Udylite Corp., 1653 E. Grand Blvd., Detroit 11.

•

Ball-Bearing Swivels

For use where the load must be turned independently of the block, Miller annular-thrust ball-bearing swivels are said to eliminate twisting and kinking of wire lines in strung hoisting blocks. They may be used on the dead end of strung blocks to facilitate stringing or restringing, and to correct any tendency of the line to crawl over. Available in assemblies with various sizes of blocks and hooks, or may be inserted in blocks now in use. General Machine & Welding Wks., 1100 E. 2nd St., Pomona, Calif.

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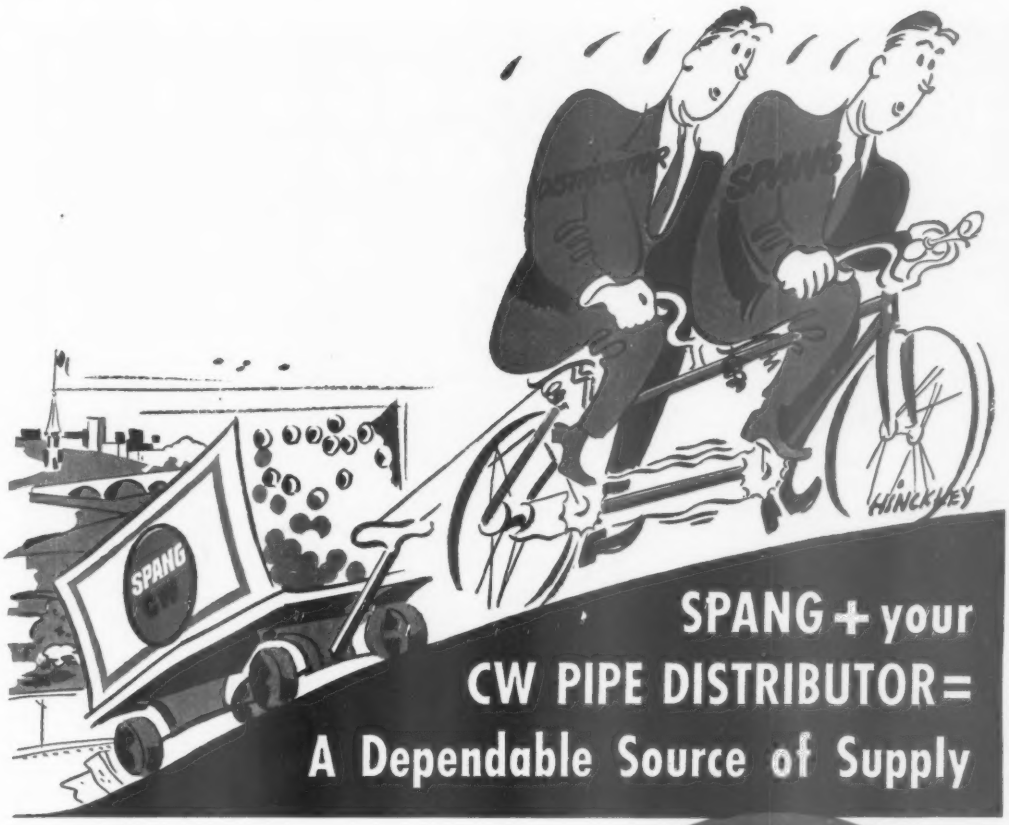
Temperature Transmitter

Force-balance type pneumatic temperature transmitter, the Transaire, is intended for use where the indication, record, or control are remotely located from the point of



SPANG + your CW PIPE DISTRIBUTOR = A Dependable Source of Supply

●Often these past years it's been an uphill battle to meet the tremendous demand for pipe. But Spang and your CW Distributor have poured everything into a united effort to win that fight of supplying you with pipe.

Spang replaced old equipment to speed production of small and critical sizes and constantly sought other ways to increase your supply of Spang CW without sacrificing quality. And your friendly Spang Distributor did everything in his power to distribute equitably his supplies of pipe.

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QUALITY *that is recognized wherever pipe is used*

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OZALID materials are UNIFORM!

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Ozalid's continuous laboratory control comes free with every package of Ozalid materials! And – Ozalid's nationwide technical organization is ready to help you in any part of the country.

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measurement and where accuracy, quick response, small thermal elements, and short range spans within the limits of —375 degrees and +1000 degrees F. are necessary. A device called Speed-Act is incorporated into the unit to overcome the lag inherently present in the response of any form of thermal measuring element. Output of the instrument in psi. is proportional to the temperature of its thermal element, states the manufacturer, who says that by means of ¼-in. O.D. copper tubing, this pressure change can be transmitted to a recording or controlling receiver located 1000 feet or farther away, depending upon conditions. Taylor Instrument Co., 95 Ames St., Rochester 1, N. Y.

•

Live Roller Conveyor

Actuating transmission of live roller conveyor consists of a roller chain mounted on one side of the frame, engaging sprockets attached to hexagon through shafts. With or without a load, according to manufacturer, the rollers may be stopped by a slight pressure of the hand, and if the line becomes filled, only the bearings turn, the rollers remaining stationary. Standard Conveyor Co., N. St. Paul 9, Minn.

•

Tank-Cleaning Cage

Aluminum alloy "Roll-Around" safety cage for tank painting, cleaning, inspection, and general maintenance, weighs 70 pounds, may be

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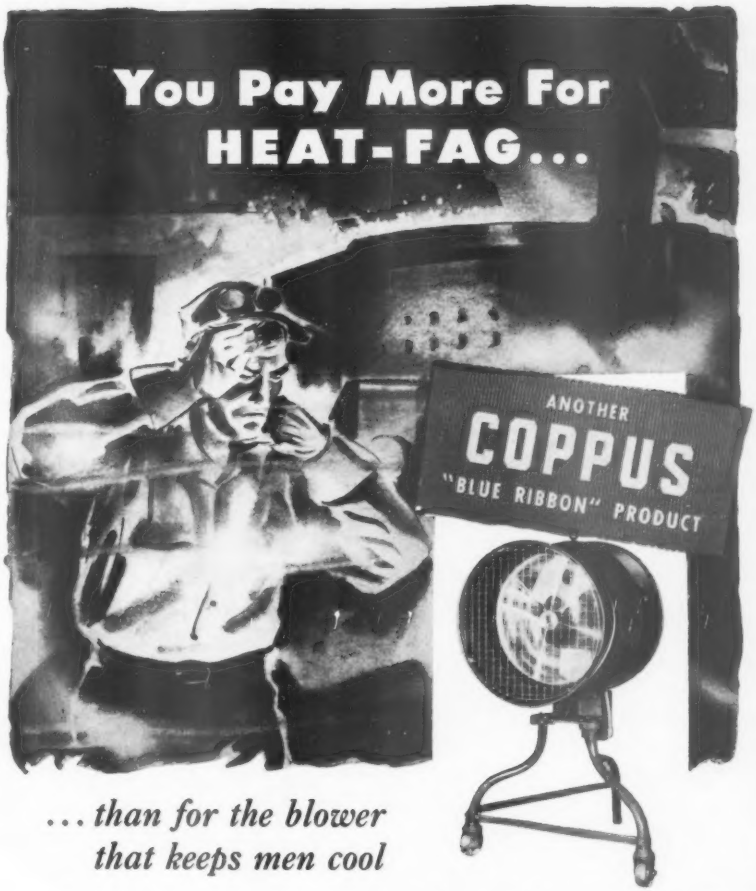

... than for the blower that keeps men cool

When hot, stagnant or fume-filled air distresses your men, your production suffers too.

Give men around furnaces or hot processes, or in confined areas, a steady supply of fresh, cool air with Coppus Blowers and Exhausters and watch their efficiency jump to a more profitable level.

There's a portable, easily adaptable Coppus "Blue Ribbon" product for practically any fresh-air requirement. The Coppus "Blue Ribbon" is the sign of precision workmanship and trouble-free, long-lasting operation. Check and mail the coupon for exact information. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

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Six frame sizes—
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Six frame sizes—
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PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

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- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
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- ☐ around cracking stills.
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- ☐ drying of walls, sheets; etc., after treated with coating material.

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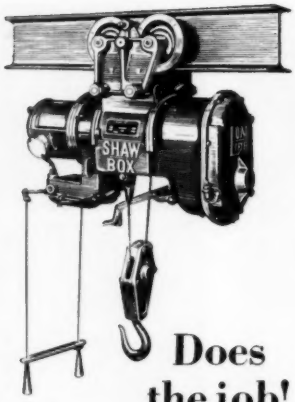
(Write here any special ventilating problem you may have.)



Does the job!

Give a heavy-duty 'Load-Lifter' Electric Hoist the toughest lifting job within its capacity. Make the loads near-capacity and the full round of the clock for as many days a week as you work!

The 'Load Lifter' will take this most grueling punishment as part of the day's work and be ready for more next morning. Rugged strength is not the sole reason. Sturdy construction and dependable performance are the real reasons, for the 'Load-Lifter' has many special features combined in no other hoist in the world.

There is a totally enclosed, ball-bearing motor, so that oil, dust, and grit cannot enter. It has one-point lubrication which means oiling at one place only about every six months. Fool-proof upper stops and safety lower blocks eliminate damage to load, hoist, and worker.

With the two-gear reduction drive, interchangeable suspension, and other features, you have the strongest, most economical lifting unit the market offers. It demands minimum attention, assures you of freedom from breakdown and keeps maintenance costs at the lowest possible level. Install 'Load-Lifters' — and forget them.

'Load Lifter' Electric Hoists are built with lifting capacities of 500 to 40,000 lbs. in all combinations required for industrial needs. They are adaptable to almost every working condition within their capacities. Send for Catalog No. 215.

MAXWELL MM MOORE MANNING TRADE MARK

'LOAD LIFTER' *Hoists*

MANNING, MAXWELL & MOORE, INC.
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Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves and 'American' industrial instruments.

carried to the top of the tank by one man, according to manufacturer. When used, a wire cable is fastened to an eye-bolt in the center of the top of the tank, threaded through the curved tube of the cage, and fastened to a block-and-tackle or electric hoist. Two sets of casters increase maneuverability. One set rolls on the top of the tank next to the rim and may be locked to prevent rolling. Bracket on which the other set is mounted is adjustable up and down permitting the casters to roll on the rim of the tank. Caster wheels are widely spaced to prevent the cage from being whirled around by the wind. Up-Right Scaffolds, 1013 Pardee St., Berkeley, Calif.

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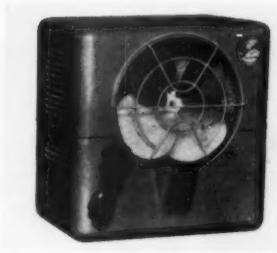

Air Cooler

Self-contained air cooler, called Sno-Breeze, weighs 22 pounds, is 16 inches wide, $10\frac{1}{2}$ inches deep. It is intended for use in cooling rooms where a water connection or drainage system is impractical. Unit is equipped with a recirculating water system that operates from a 3 1/3-gal. reservoir, sufficient, according to manufacturer, to last about five hours. "Rain-drop" water distribution system washes and cools the air; quiet, heavy-duty rubber-mounted motor drives a deep-pitch 4-blade fan, dispersing 800 cu. ft. of filtered, washed, cooled air per minute. Palmer Mfg. Corp., Phoenix, Ariz.

•

Hand Trucks

For handling crated or uncrated materials, line of hand trucks, called Rol-A-Lift, is said to carry loads too

REDUCE COSTLY TANK MAINTENANCE AND OUT-OF-SERVICE TIME DUE TO INTERIOR RUST AND CORROSION

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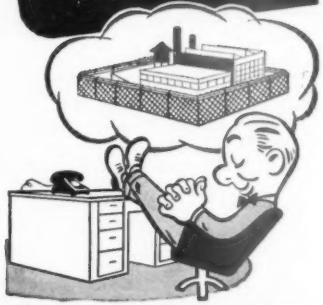
You can relax when your property is fenced by STEWART



No need to lose any sleep over vandals molesting your industrial property when it's surrounded by a Stewart Chain Link Wire Fence. fence framework makes it the heaviest and The All Beam construction of the Stewart strongest chain link wire fence manufactured. A Stewart Fence will give you the utmost in protection, and many years of dependable, low cost service. Write for Catalog No. 83.

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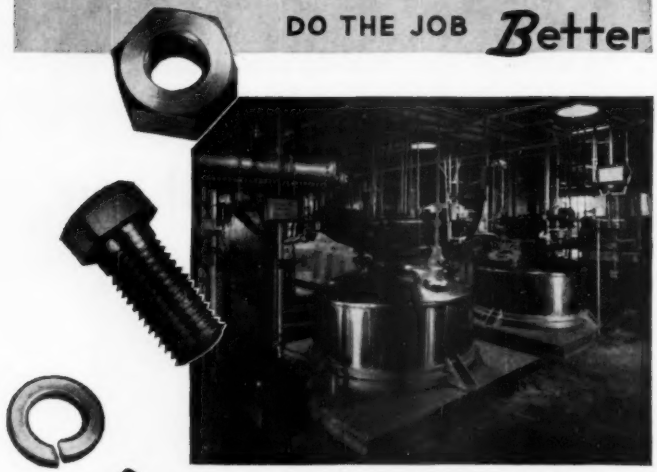

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This year more stainless fastenings will be used by industry than ever before, because every day industry discovers another spot where stainless works better! Whether your fastening problem calls for superior strength . . . corrosion resistance . . . non-magnetic quality . . . permanence . . . resistance to heat or cold . . . re-use quality . . . shock or vibration resistance . . . or fine appearance . . . *count on stainless for the answer!* And count on Anti-Corrosive to have just the fastening you need!

At Your Fingertips . . . the Largest Stainless Fastening Stock to Be Found Anywhere!

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heavy or bulky for work trucks and to move loads into tight places where neither fork trucks nor cranes can operate. Available in 2000-, 4000-, 6000-, and 8000-lb. capacities. Designed to be used in pairs, one truck on each side of the load. When in place, the trucks are jacked up, lifting the load and putting it on full-swiveling casters. Skarnes Engineering & Supply, Inc., 2428 Riverside Ave., Minneapolis 6.

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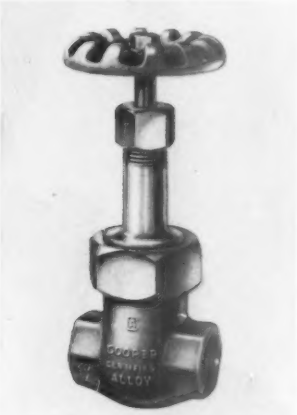


Stainless Steel Gate Valve

Small-size stainless steel union bonnet gate valve is constructed with ball-and-socket point contact disks said to adjust themselves in any position. Six turns of packing provide sealing. Available in various stainless alloys, in ½-, ¾-, and 1-in. sizes, valve is suited for fixed plant installations as well as for use on fabricated equipment. The Cooper Alloy Foundry Co., Bloy St. & Ramsey Ave., Hillside, N. J.

•

Program Controller

For controlling temperatures by predetermined schedules, Model CPR time-temperature program controller measures 9x18x8 inches. It is designed for flush or surface mounting. Upper section contains a modified electronic controller having plug-in

MORE DATA ON ALCOA EC ALUMINUM

on the job Today

Lighter weight, lower cost

Q *How much voltage drop do you get with ALUMINUM?*

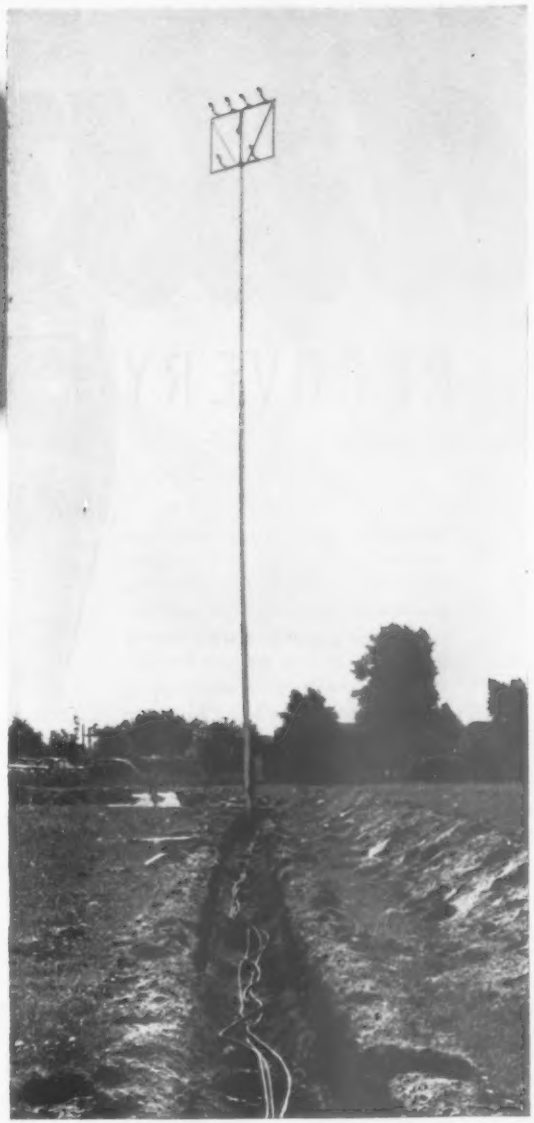
A *Aluminum conductors two AWG sizes bigger than copper give you the same voltage drop..and cost less, weigh less*

Wire and cable with Alcoa E.C.* Aluminum conductor give you lighter weight and lower cost, even when specified two AWG sizes bigger. And this gives you greater current-carrying capacity.

Similarly, aluminum two sizes bigger has tensile breaking strength greater than insulated copper. Joints and terminals can be soldered, welded, or made mechanically by standard methods with standard tools. Aluminum is easier to handle on the job because it weighs so much less.

Alcoa makes light, strong, conductive E.C. Aluminum; leading wire manufacturers draw, strand and insulate it, and sell it under their own trade-marks. Investigate the savings Alcoa E.C. Aluminum can give you! Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 1900 Gulf Building, Pittsburgh 19, Pennsylvania.

*E.C.: *Electrical Conductor* Aluminum



220/110-volt secondary feeders for a softball field lighting system. Maximum run, 375', maximum voltage drop, less than 2 per cent. 300 mcm aluminum, insulated, direct burial.

ALCOA EC ALUMINUM

FOR ELECTRIC WIRE AND CABLE

Simplicity...

an absolute must in

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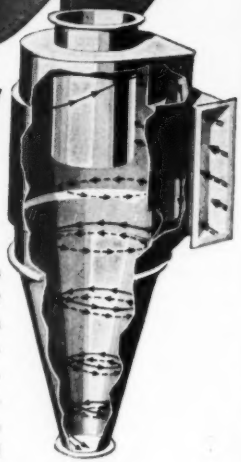
RECOVERY



Complex design with many small parts multiplies the chance of trouble in any dust recovery system. The ideal equipment has no moving parts to maintain, no small passages to clog up and cause expensive shutdowns. Buell sticks to the large high-efficiency cyclone design-proportioned to each individual job. It is based upon sound aerodynamic principles which result in high operating efficiency with a minimum of turbulence and wear. An added refinement is the exclusive van Tongeren 'Shave-Off'—without which no truly efficient cyclone performance can be expected.

It takes a multi-page catalog to discuss the problems of collector efficiency in dust recovery. Buell publishes such a book, which is yours for the asking. Write: Buell Engineering, 12 Cedar Street, New York 5, N. Y.

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Engineered Efficiency in

DUST RECOVERY

construction, high-rating snap-action control contacts. Uniform control levels are said to be independent of line voltage variations. The lower compartment contains a synchronous-motor-driven cam, which automatically positions the control index arm of the controller. Malleable material of the cam may be marked and sheared to produce any time cycle on the printed disk. Taco West Corp., 515 N. Noble St., Chicago 22.

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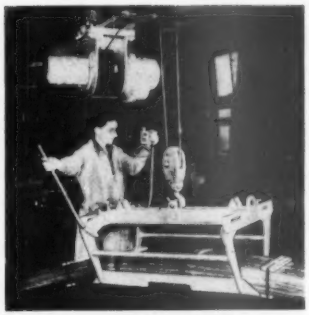

Sheet or Bundle Grab

For handling sheet metal or bundled material on overhead hoists in plants with low headroom, fulcrum-action 3-ton capacity grab is adjustable from 12 to 42 inches and carries a stack up to 10 inches high. Wide-angle jaws permit clearance of cross members on skids. Sheet material can be stacked to within 5 inches of hoist hook. Two end hooks are furnished to support sheet lengths up to 10 or 12 feet and to prevent slippage of unbalanced load. Rada Products Co., 2911 Carroll Ave., Chicago 12.

•

Thermocouple Indicator

High-temperature indicator, Model XA-100 Xactemp, is engineered for general, noncritical use. It is claimed meter is accurate within a fraction of a scale division, and is calibrated for either Iron-Constantin or Chromel-Alumel thermocouples, with a choice of several scale ranges. Furnished enclosed in a metal case suitable for either flush or surface mounting. Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16.

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Paint for Galvanized Metal

Trademarked "Quon-Kote," paint for new galvanized metal surfaces

Handle it "THRU-THE-AIR" Dependably!

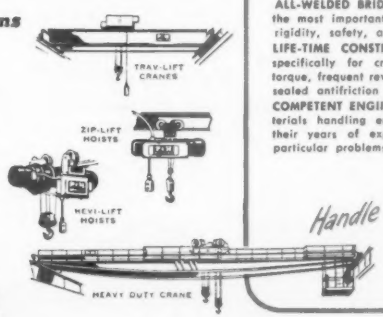
There's only *one* Trav-Lift! P&H builds it! But it's available in capacities up to 15 tons — with various lifting speeds and spans — with floor or cage control. In short, your Trav-Lift is tailored to fit your specific needs.

Designed and built with the same safety factors as a heavy-duty crane, standardized designs and lower costs make the Trav-Lift your best bet wherever service needs do not warrant investment in a heavy-duty crane.

Dependable? It's a product of P&H — America's leading builder of overhead materials handling equipment!

Trav-Lift Capacities Run up to 15 Tons

See how the P&H Trav-Lift Crane can bring you new and broader economies in materials handling. Write for Bulletin H-13.



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VARIABLE SPEED FULL MAGNETIC CONTROL provides 5 distinct steps for all motions: controlled from pendant push-button or from operator's cab.

SAFE — Only 110 volts at the push-button when floor-controlled. Start-stop main line contactor, disconnect switch, thermal overload protection, magnetic limit switch and powerful brakes assure maximum safety.

ALL-WELDED BRIDGE AND TROLLEY incorporates the most important factors in reliable service — rigidity, safety, accessibility.

LIFE-TIME CONSTRUCTION — Motors designed specifically for crane service — high starting torque, frequent reversal, etc. Shaved gears, grease sealed antifriction bearings throughout.

COMPETENT ENGINEERING SERVICE — P&H materials handling engineers will gladly give you their years of experience in working out your particular problems. Write us.

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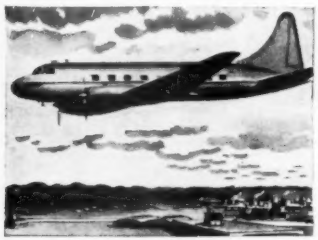
That low $3.58 figure was total cost for Air Express and included door-to-door service. That makes the *world's fastest* shipping method exceptionally convenient, complete, and easy to use.



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may be used on Quonset and other steel buildings which heretofore have required weathering or chemical treatment before a successful bond could be obtained. Compounded with a linseed-oil base to react chemically with the zinc, it is said to form a tightly bonded protective coat without a primer. Available in white, cream, red, green, and gray. Great Lakes Steel Corp., Stran-Steel Div., 3750 Penobscot Bldg., Detroit 26.

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Portable Power Saw and File

Mechanism of portable power saw and file rides upon three heavy-duty ball bearings and is sealed in lead-blended lubricant. Called the Key-Hak, device may be attached to electric or air drill or motor-driven flexible shaft, using ¼-in. or 5/16-in. Jacob's chuck. Unit weighs less than four pounds, is 11½ inches long. It will cut through wood, composition, tile, and all metals, including plate and sheet-stock, either straight line or radius cuts. Producers & Distributors, Inc., 4015 MacArthur Blvd., Oakland 19, Calif.

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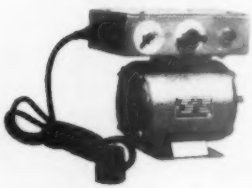

Three-Speed Synchronous Motor

Hysteresis-type synchronous motor, Elinco Model GH-371, provides three synchronous speeds. Operation is switch-controlled, or can be relay-controlled, providing for clockwise or counterclockwise rotation. It is reversible while running, and can also change from one speed forward to a different speed reverse. Rated at 1/100, 1/60, and 1/40 hp., respectively, at 900, 1800, and 3600 r.p.m. Operates from 115-volt 60-cycle single-phase a.c. Motor measures 4⅝ inches in diameter, 5⅞ inches in length, excluding shaft. Electric Indicator Co., Stamford, Conn.

•

Belt-Conveyor Carrier

Ball bearing belt-conveyor carriers, called SealMaster, feature rigid, one-piece welded steel frames designed to tilt in the direction of the belt travel and keep belt centered with-

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FOR LIGHT-METAL FASTENING

PHILLIPS HEAD SCREWS with the famous patented recess that centers the driver automatically. Powerdrivers may be used at high speeds without danger of slipping. Withstands high torque pressures because strain on screw is exerted deep in the head.

SEMS are pre-assembled lock-washer screws that speed assembly operations by eliminating an extra operation and time-wasting fumbling. Washers rotate but cannot come off. Available with many different types of washers and heads.

SLOTTED HEAD MACHINE SCREWS and nuts. The "old reliable", in its finest form! Lamson machine screw heads are uniformly concentric, slotted deeply and accurately. A wide range of sizes available.

CLUTCH HEAD SCREWS require little end-pressure on the driver. No "back-out" tendency! Driver bit sticks in screw recess when bit is turned to left—releases when screw is tightened down.

Fasteners in STEEL, BRASS, BRONZE *and* ALUMINUM

• Inefficiency on assembly lines can often be traced to fastener troubles. Therefore it's important that fasteners be selected to do the job with a minimum of waste motion, fumbling and product damage.

Lamson & Sessions makes a wide selection of fasteners especially engineered to perform hundreds of assembly jobs faster and therefore, at less cost.

If you suspect that fastener inefficiency is slowing up your assembly line, tell us your problem and chances are we can suggest a remedy.

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General Offices: 1971 West 85th Street, Cleveland 2, Ohio

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"One Dependable Source for All Fastener Needs"

SEMS	LOCK NUTS	NUTS	STUDS
STOVE BOLTS	LAG BOLTS	WASHERS	RIVETS
TAPPING SCREWS	ROPE CLIPS	SET SCREWS	PLOW BOLTS
"1035" CAP SCREWS	MACHINE BOLTS	CARRIAGE BOLTS	COTTER PINS

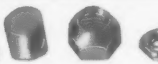
—CUT ALONG THIS LINE—

WANT MORE INFORMATION on any of these fasteners? *CHECK*—and *CLIP* this strip.

LAMSON LOCK NUTS: Economical, vibration-proof. Can be re-used repeatedly.

"1035" SET SCREWS: Cup point type, hardened, heat-treated.

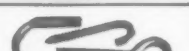
COTTER PINS: Steel, Brass, Aluminum and Stainless Steel.



SPECIAL NUTS: Cone, Barrel, Oblong, Plier, Tri-Slot, Half-round, etc.

PHILLIPS AND CLUTCH HEAD: Machine Screws and Tapping Screws.

MILLED STUDS: Concentric, accurate, in a full range of sizes.



"BENT" BOLTS: Including U Bolts, Eye Bolts, Hook Bolts, etc.

WEATHER-TIGHT BOLTS: Eliminate counter-boring in wood assemblies.

PIPE PLUGS: Forged Steel, heat-treated.

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1971 W. 85th St., Cleveland 2, Ohio

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the most practical DETACHABLE REFLECTORS *ever made!*

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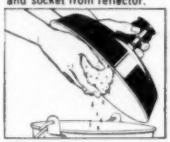
Release spring-set lever. Reflector and lamp are detached.

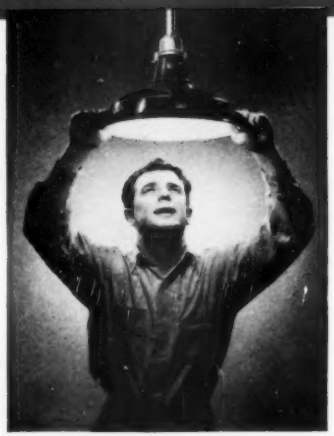
Slight upward pressure and a quarter turn remove lamp and socket from reflector.



Reflector may be immersed in water for thorough cleaning.

Twist of wrist securely locks lamp and socket to reflector.

Pressing reflector into hood, locks reflector into place.



Here's Appleton's answer to the ever-present problem of installing and servicing light reflectors quickly and easily. The Diskonect Reflector is attached or detached from the hood instantly by means of a snap lock—without twisting, tugging, forcing or the use of tools. The heavy drawn-steel hood is fitted with a spring-set lever which locks or unlocks the porcelain enameled reflector.

Diskonect Reflectors are finished in permanent porcelain enamel and offered in a wide variety of styles. Complete "come-apart" construction permits cleansing of all parts separately, a time-saving feature that enables you to maintain a higher standard of lighting efficiency.

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out need for guide rollers. An inverted angle base and end brackets are said to shed material and keep rollers free. Removable rollers and bearing housings may be replaced or interchanged. Stephens - Adamson Mfg. Co., Aurora, Ill.

•

Seatless Piston Valves

Stainless steel piston sliding into a replaceable ring in seatless piston valves, called Strahman, is said to effect positive closure because of long sealing surface. The ring, usually made of laminations of compressed asbestos, is also available in materials suitable for hard-to-hold liquids or gases. It may be further compressed against the piston by a take-up on the bonnet while the valve is in service. Suitable for low or high temperature range of −125 to +750 degrees F. Klingerit, Inc., 20 Hudson St., New York 13.

•

Time Recorder

All-purpose time recorder, Model 3801, is designed to record employee arrival and departure time as well as time spent on individual operations. It consists of individual replaceable units made of hardened materials treated to resist rust; equipped with Oilite bearings to eliminate need for oiling. Latham Time Recorder Co., 76 3rd St., N. W., Atlanta, Ga.

•

Velocity-Limiting Valve

For use where top limits of flow velocity and volume are required, velocity-limiting valve may be connected to any air or gas line. When

Bunting No. 72 Bearing Bronze, (SAE 660) the general purpose bearing alloy pioneered by Bunting has special bearing properties that specifically fit it to the majority of your bearing problems. These properties are the result of the proper balance of the main constituents, namely copper, tin, lead and zinc, with correct foundry procedures.

To produce many thousands of cast bronze bearings day after day, to the uniformly high quality synonymous with the name Bunting requires precise foundry control. This control starts with the raw materials necessary for production such as molding and core materials, core binders, fixed carbon fuel, pre-alloyed metal in ingot form purchased to Bunting's own rigid specifications, and virgin metals used for ladle additions to control metal composition. Then, too, melting and casting procedures are carefully controlled for the following reasons:

1. —To keep gas absorption during melting to a minimum, thus assuring sound, gas-free castings.
2. —To effect complete deoxidation of the metal in the ladle before pouring.
3. —To insure that each particular casting is poured at the precise metal temperature consistent with highest quality.
4. —To insure that molding and core materials are so processed that the correct properties are obtained for good castings, and
5. —To insure metal of uniform composition meeting the specification.

Trained foundry and laboratory personnel are required to carry on this exact control as well as chemical and metallurgical equipment of the latest design. Bunting has always taken pride in being the leading producer of bearing bronze of the highest quality and has the facilities to maintain this leadership.

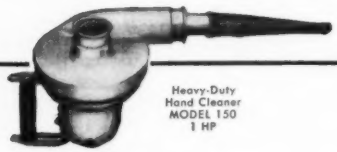
The leading distributor in your market almost certainly is the Bunting distributor. He carries for your convenience complete stocks of Bunting Standard Stock Bearings and Precision Bronze Bars. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

85

PRECISION BRONZE BARS
BRONZE BEARINGS
BUSHINGS

Bunting®

Typical of Ways
General Electric
Heavy-Duty Cleaners
ARE USED IN INDUSTRY



Heavy-Duty
Hand Cleaner
MODEL 150
1 HP

CANDY MANUFACTURER... A manufacturer of candy-coated chewing gum uses a General Electric Heavy-Duty Hand Cleaner to get rid of peppermint dust and fumes around the tumbling machine. This is the same type of machine used for dust control in many other manufacturing plants the country over.

Heavy-Duty
Cleaner Model
184-A

COSTUME JEWELRY

A manufacturer of women's bracelets uses a General Electric Heavy-Duty Vacuum Cleaner like the one shown here to pick up gold particles off the floor. Weekly cleaning to recover this precious dust is the rule.

The same manufacturer uses a General Electric Hand Cleaner attached to the gold-polishing machine to pick up scrap as it comes off the machine. This is still another example of how this blower-suction model serves industry. What's *your* need?

From removing oil-burner soot to cleaning the plant, cost-conscious plant executives are relying more and more upon General Electric's heavy-duty cleaners.

SPECIALIZED TOOLS — brushes and nozzles for various uses — expand the many services of these modern suction cleaners. In every particular, cleaners and accessories are designed with true General Electric skill . . . and built to give years of faultless service.

You can reduce maintenance costs by providing your help with the right General Electric cleaning equipment. Write today for specification literature — use the handy coupon!

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INDUSTRIAL CLEANERS, Dept. 22-1313
GENERAL ELECTRIC CO. Bridgeport 2, Conn.

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ADDRESS.....

CITY..... STATE.....

set to any of its many pressure calibrations, a stainless steel ball is pulled up against its seat and held in the closed position by line pressure whenever the flow exceeds the setting. When pressure falls, the ball drops off the seat and resets itself. An adjusting screw lowers or raises the setting. Available in ¼-in. pipe size, other sizes on order. Pneu-Tool Devices, Inc., 3122 N. California Ave., Chicago 18.

•

Floor-Type Tow Conveyor

Continuous-chain conveyor, called Towveyor, is constructed with the chain running in a steel slot below the floor, with no part of the conveyor projecting above the surface. In use, a towing pin bolted to the end of any standard four-wheel truck or trailer is dropped into the slot. One of the pusher dogs spaced at intervals on the chain engages the pin and moves the truck along the route. Two-wheel trucks may also be used with a dolly. Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4.

•

Circuit Breaker Plug

Attachment plug is designed to guard against overloading, stalling, or rotor locking on machines employing fractional-horsepower motors. It operates only when conditions become dangerous, and on the particular appliance on which it is installed. Other devices on the same circuit can thus continue to function. Manufacturer states that it is easy to operate, is tamper- and foolproof. To reset, it is only necessary to remove the plug from the receptacle, then raise and lower the lever between the prongs. Available in a range of ratings up to 10 amperes, with special current load ratings available on order. Hopax Electric, Inc., 547 Greenwich St., New York 13.

•

Window Shade

Made with a top section that may be lowered to any position up to 48 inches from the top, Ra-Tox wood splint ventilating shades feature a horizontal rail suspended from the

must your cable

—stand up under cutting oils?

Chemically inert G-E Flamenol® cable safeguards your low-voltage plant circuits against oils, cutting fluids, acids and alkalies.

—cut down fire hazards?

Flameproof Flamenol cable can't spread a fire, because it won't support combustion.

—save installation time?

Flamenol cable strips cleanly to simplify terminating, and its hard, sleek finish makes pulling through raceways easy.

—fit in small space?

With no added covering needed, Flamenol cable's smaller diameter saves space, makes for neater wiring.

Wherever your plant wiring calls for low-voltage cable that's long-lasting under conditions as tough as they come—that's the place for G-E Flamenol cable. Thermoplastic-insulated Flamenol cable, made by General Electric, is completely controlled in the making, from raw material to finished product. That's why you get the uniform quality that assures greatest service reliability. For more information, write for Bulletin GEA-4352, or call your nearest G-E office. Section W28-634, Construction Materials Department, General Electric Co., Bridgeport 2, Connecticut.

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Standardize and save

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In all standard 600-volt constructions—is one of six modern cables mass-produced and available from stock. Standard designs permit quicker delivery and a lower price than special types. Each offers advantages in its recommended applications.

CORONOL® -GEOPRENE

For high-voltage power distribution. Has superior resistance to heat, corona, and aging. Ask for bulletins GEA-1788, GEA-4848.

VERSATOL® -GEOPRENE

For low-voltage distribution and branch-circuit wiring to motors and controls. Resists moisture, heat, and aging. Request bulletin GEA-4848.

INTERLOCKED-ARMOR

For overhead power distribution throughout the plant. Needs no conduit, speeds installation. Bulletin GEA-4507.

VARNISHED-CAMBRIC LEADED

For high-voltage feeders, distribution in underground ducts. Ideal for heavy loads in wet locations. Bulletin GEA-2623.

GEOPRENE CONTROL

For connection between control panels and portable pushbutton stations on large machines. Resists rough handling and repeated flexing.

Flamenol CABLE

Dust, even in small amounts, has a direct bearing on production costs. Dust has never been known to contribute to efficient operation — on the other hand DRACCO Dust Control ALWAYS saves money in several ways. DRACCO Dust Control creates better working conditions that attract the best workers, prolongs useful life of equipment, this reduces maintenance cost and the time equipment is down. General plant efficiency is increased and this naturally leads to LOWER COSTS. DRACCO Engineers have over 30 years experience in dust and fume control — why not consult them?

DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio *New York Office:* 130 W. 42nd St.

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

top fixture rail of the shade by means of wire cables, which carry its weight. When upper section is closed, entire shade may be rolled up, the horizontal rail and wire cables rolling up with the shade. Made of basswood splints and fishnet twine, with narrow spaces between the splints to permit passage of diffused light as well as air from open windows. The Hough Shade Corp., 1031 Jackson St., Janesville, Wis.

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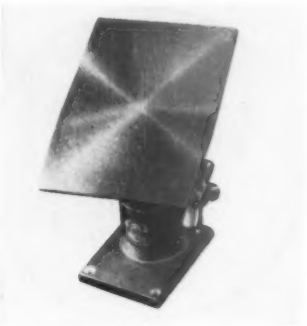


Work Positioner

Lightweight self-contained work positioner, called the Positionette, is adaptable to practically all sizes and shapes of fixtures for holding work, according to the manufacturer. It may also be used as a soldering base and angle plate. Made of heavy cast aluminum, table is 5½ inches high, weighs 1½ pounds, measures 4x5¾ inches. A handle adjusts the tension to any working position. Solon Foundry, Inc., 1510 University Rd., Cleveland 13.

•

Power Truck

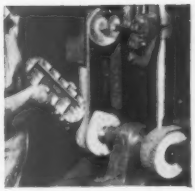
Riding-type "JackLift" power truck is available in platform pallet, and tractor styles. They retain all features of manufacturer's "walkie" electric trucks, with the addition of a through corridor from which operator controls the truck. Long handle, curved for comfort of the rider, permits truck to be operated from a walking position when required. Lewis-Shepard Products, Inc., 210 Walnut St., Watertown 72, Mass.

•

Fluorescent Starters

For use on the new Circlarc fluorescent lamps, starters FS25 and FS85 are designed to furnish fast, reliable performance. The FS25 is

Dust chutes cause no interference with large pieces.



Guard raises, or swings clear, to expose any part of belt.

Platen in up-position provides flat working surface.

Easily made into a buffing machine, for many jobs.

With platen down, pieces are worked from under belt.

new!

Low cost! Portable! Takes little floor space! Does many metal-removing operations formerly requiring heavy, expensive machines!

DELTA® *Belt* Grinding, Polishing, and Deburring Machine

Can be used to do all this—and more!

- Clean out slots
- Remove flash in corners
- Remove fins
- Smooth up crowns
- Remove nibs
- Remove parting lines
- Chamfer corners

$130.75
without adjustable guards, dust chutes, motor, switch, or switch rod.
Price subject to change without notice.
Available in models to suit varying needs
See Bulletin AD369

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

DELTA MILWAUKEE®

You speed up flashing, grinding, cleaning, and polishing, with this new Delta *Belt* Grinding, Polishing, and Deburring Machine. You save time, labor, and material.

In this condensed unit on a welded steel stand, you get a production machine at low initial cost. With accessories to meet your particular requirements, it does hundreds of different jobs.

There are no set-up wheels to bother with; no grinding wheels to dress. Instead, you use coated abrasive belts that are inexpensive, long-wearing, quick and easy to replace.

The Delta *Belt* Grinding, Polishing, and Deburring Machine is carefully engineered for long, trouble-free service. Delta quality features assure you of that: Preloaded, lubricated-for-life ball bearings. Precision-bored bearing seats. Dynamically-balanced pulleys. All-around rugged construction. Delta Dust Collector available for use with this unit protects workers' health and expensive machinery.

Make metal-removing fast and economical. Put Delta *Belt* Grinding, Polishing, and Deburring Machines to work for you on your production line—and in your inspection department, to clean up imperfections on the spot.

Have your nearby Delta distributor show you this new machine. Send coupon for free Bulletin AD369.

Ask your distributor about easy time-payment plan!

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WM-25

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LINEMAN PLIERS with HANDLEGRIP
Powerfully built cutting pliers... shown with plastic insulating grips ... guaranteed shock protection against average voltage.
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PLIERS
An Exclusive Snap-on Product
will far outlast ordinary brands!
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3. Scientific design which distributes strain over entire tool assuring maximum strength.
4. Smooth, perfectly matched, easy riding precision machined joints.
5. Sharp, deep milled teeth giving intense gripping power.
6. Hand filed, perfectly aligned blades on all cutters.
7. Spring tempered Vacuum-Grip "Non-Slip" handles.
25 patterns. Available only through Snap-on's nationwide, direct-to-user tool service .... not at any hardware or mill supply stores.
HEAVY DUTY COMBINATION PLIERS
A popular favorite with automotive mechanics, combining powerful cutters with tremendous gripping strength.
DIAGONAL CUTTERS
Finest diagonal cutter made ... hand filed, perfectly matched cutter jaws. Recommended for cotter pins and tough cutting jobs.
NEEDLE NOSE PLIERS
Despite the slender nose they are extremely rugged. Specially machined for wobble-free action.
Snap-on Tools
THE CHOICE OF BETTER MECHANICS
SNAP-ON TOOLS CORPORATION
8044-F 28th Avenue
Kenosha, Wisconsin

for use with the 25-watt 33-in. and the 18-watt lamps; the FS85, suitable for use with the 85-watt 60-in. lamp, may also be used with 100-watt 60-in. lamp. Sheldon Electric Co., Inc., Irvington, N. J.

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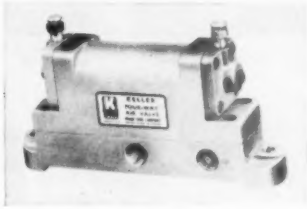

Four-Way Air Valves

Line of 4-way air valves of the balanced-piston type is designed to control double-acting cylinders in air tools or fixtures. Valve is actuated by poppet-type control buttons which exhaust air from either end of a balanced stainless steel piston. This operates a rubber-faced slide valve which is the seal for directional control of the flow of air. All pipe connections are located in the base for accessibility without disconnecting the air lines. Available with ¼-, ½-, and 1-in. pipe threads, air capacities of 30, 90, and 350 cfm., respectively. They can be bench mounted, or mounted as an integral part of a fixture with remote control. Keller Tool Co., 4700 Hall St., Grand Haven, Mich.

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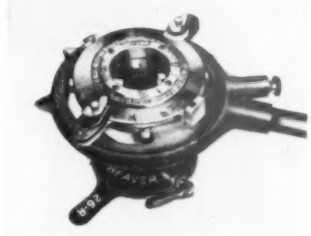

Pipe Threader

Self-contained pipe threader, Model 26-R, threads 1-, 1¼-, 1½-, and 2-in. pipe with one set of dies. Manufacturer states that self-centering chuck provides alignment for straight pipe lines, but that "drip" threads may also be cut. Adjustable for either standard taper or straight electric conduit threads, it cuts standard or outsize threads. Beaver Pipe Tools, Inc., Dana Ave., Warren, O.

•

Incandescent Lamp

Finely ground silica coating on inside of frosted bulb is said to produce good light diffusion, soft white light. Available in 100-watt A21 size, it is suitable for use where lamps must be partially or completely unshielded and uniform brightness is required. Champion Lamp Works, Lynn, Mass.

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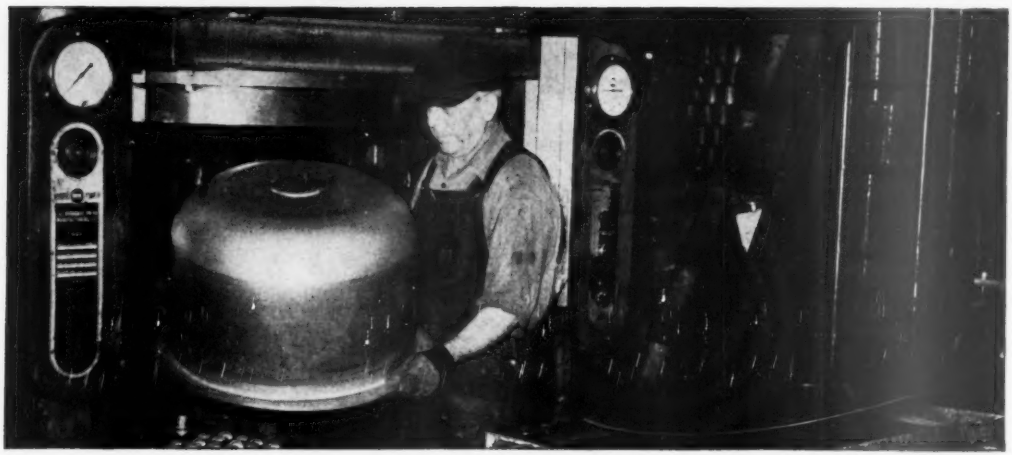
WASHING MACHINE TUBS OR 500-GALLON KETTLES. Using 40¾" circular blanks of ENDURO Stainless Steel, the 300-ton hydraulic press below forms 21½" inside diameter washing machine tubs in a single 15¾" draw. When the product is too large for drawing—as in a 500-gallon kettle—you can weld formed sections together easily and soundly.



THERE'S SO MUCH YOU CAN DO WITH IT ...AND SO MANY THINGS THAT IT DOES WELL!

Whether you consider it from design or actual production viewpoints, Republic ENDURO Stainless Steel is a most versatile material.

You can fabricate it by every modern method —to practically any desired shape. You can stamp, draw, roll, spin, machine, forge, cast, weld, solder, rivet and otherwise work it. Although certain simple precautions must be taken, you can employ the same equipment used for carbon steels.

On the other hand, there are so many things that ENDURO does well. It greatly simplifies the age-old problem of rust, corrosion and oxidation. Its inherent high strength permits weight saving through the use of thinner sections. It maintains its strength at high or low temperatures. It does not contaminate metallically. It is remarkably easy to clean. Its distinctive beauty encourages unusual decorative treatments. Best of all, it usually costs less in the end.

There are many types of ENDURO—each with specific qualities to do certain tasks well. There is a wide variety of finishes and physical forms to meet all needs. There is literature on ENDURO to help you use and fabricate it to best advantage. Write us.

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✓ ***Check ALL 12 advantages:*** • RUST AND CORROSION-RESISTANCE • HEAT-RESISTANCE • HIGH MELTING POINT • LOW COEFFICIENT OF EXPANSION • HIGH STRENGTH • GOOD DIMENSIONAL STABILITY • NO METALLIC CONTAMINATION • EASY TO CLEAN • EASY TO FABRICATE • EYE APPEAL • LONG LIFE • LOW END COST

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cuts cost 42%

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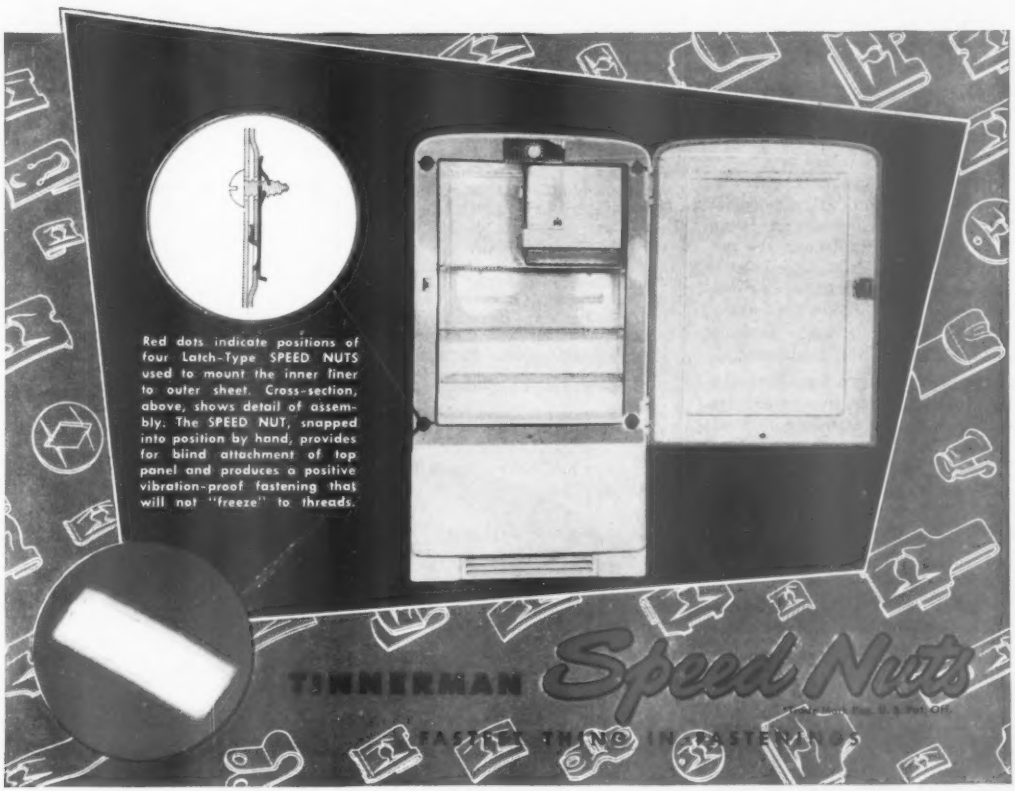
1. Cost of fasteners was reduced 24% . . .
2. Portable welding equipment was transferred to other jobs . . .
3. *Total assembly savings of 42% was effected!*

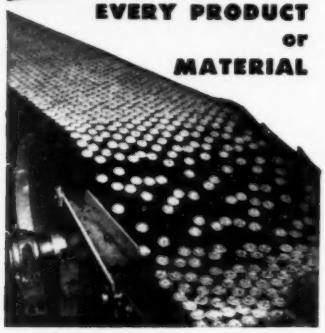
Just this *one* of the many SPEED NUT applications on this product created a savings of major proportions.

In your search for ways to reduce *your* costs or improve product quality, why not investigate the Tinnerman SPEED NUT brand of fasteners? The complete line includes more than 4000 shapes and sizes.

Let us conduct a thorough Fastening Analysis of your product. Your Tinnerman representative can supply details. He's listed in major city phone directories. Or write: TINNERMAN PRODUCTS, INC., 2040 Fulton Rd., Cleveland 13, Ohio. In Canada: Dominion Fasteners Limited, Hamilton.


Red dots indicate positions of four Latch-Type SPEED NUTS used to mount the inner liner to outer sheet. Cross-section, above, shows detail of assembly. The SPEED NUT, snapped into position by hand, provides for blind attachment of top panel and produces a positive vibration-proof fastening that will not "freeze" to threads.
TINNERMAN
Speed Nuts

THERE'S A *Cambridge*
WIRE BELT
to combine movement with processing
for
EVERY PRODUCT or MATERIAL



Crackers by the thousands pour from the oven on a Cambridge Balanced Belt. Open mesh permits free heat circulation . . . moving endless belt gives continuous production of a uniform product . . . maximum time savings.

Whether your product is big and bulky or small and fragile, if it must move during processing or production, a Cambridge Woven Wire Conveyor Belt can do the job.

Woven from any metal or alloy to any mesh or weave, Cambridge belts offer dependability, long life, freedom from time-wasting shutdowns for repairs. Among the specially designed Cambridge belts in service today are continuous conveyorized installations for baking, quenching, tempering, washing, drying, cooling and packaging.

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more about the items on this page

Letters to the addresses given will bring you further information.

PROJECTOR for 16 mm. sound film, with 8-in. speaker and 4-stage amplifier housed in single case. Reel takes 400 feet of film, rewinds automatically with no change of reels. Visual Products Group, Radio Corporation of America, Camden, N. J.

MOTOR CONTROL LAYOUT TEMPLATES made of bristol board to exact dimensions of actual equipment. For visualizing space requirements and arrangement of installations. Kits contain 47 templates, including starters, relays, transformers, terminal blocks, contactors. The Arrow-Hart & Hegeman Electric Co., Hartford 6, Conn.

PLASTIC SPRAY prevents tarnish, corrosion, rust; clear glossy finish. Resistant to alcohol, oil and grease, alkalies; may be used on metal, wood, leather, paper. Comes in spray-top dispenser. Bridgeport Brass Co., Bridgeport 2, Conn.

FIRST AID CABINETS. White enameled steel, clear glass door. Unit 66, for plants with 50 to 100 employees, contains 58 items; hinged drop-leaf ledge at bottom for working shelf. Unit 36, for small plants, contains 45 items, pull-out ledge at bottom. Industrial Products Co., 2830 N. 4th St., Philadelphia 33.

COATING. Inhibited bright dip for zinc, zinc plated, cadmium, brass, magnesium products. Produces bright surface, passivity to electricity. Resistant to stain, tarnish, white corrosion. The Chemical Co., 54 Waltham Ave., Springfield 9, Mass.

TIPPING DEVICE. Used with chain block, electric hoist, crane, other lifting mechanism. Tips loads after they are lifted, holds them in position. Capacity 2000 pounds. Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., Muskegon, Mich.

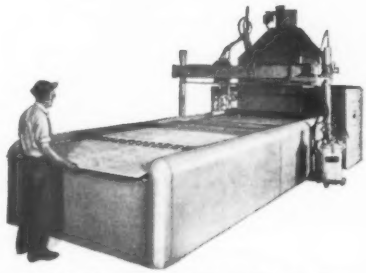
WHITE BLACK BOARD may also be used as tack board. Small magnetic bars, called Magnetacks, which cling to metal backing of board, hold up to ten thicknesses of paper. Messages written with washable crayons, called Plus-Lite Crayoffs, may be wiped off with dry cloth. Chatfield-Clarke Co., 1639 Tenth St., Santa Monica 36, Cal.

WELDERS' PROTECTIVE CLOTHING made of lightweight flameproof fabric called Asbeston. Durable, washable. Available in aprons, bibs, jackets, arm sleeves. Lester L. Brossard Co., 540 N. Michigan Ave., Chicago 11.

WOOD FLOORS OVER CONCRETE without use of sleepers. Plank subbase cemented directly to concrete

CUP-TYPE GOGGLE. Frame of molded thermoplastic, molded rubber headband; no buckles, sharp edges. Slip-disk size adjustment. For chipping, welding. Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12.

Putting Air to Work... with Artistry!



This horizontal transverse automatic spray machine is a typical example of DeVilbiss engineering skill. It is capable of coating up to 9600 square feet of wall board every hour.

Artistry in the skillful use of air enables the trumpet player to produce beautiful harmonious tone patterns rather than blatant, discordant noise.

Artistry in the skillful use of air has enabled DeVilbiss to earn an enviable reputation as the world's foremost designer and producers of spray guns and spray finishing systems.

After 61 years of spray equipment manufacturing experience the name DeVilbiss is accepted to mean just one thing . . . *finest performance* . . . dependable performance that helps manufacturers improve product quality, save valuable man-hours, cut costs, produce for less and sell for less. When you want information on "how to spray it best at lowest cost" consult DeVilbiss.

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DE VILBISS *means* **Quality** *in all four . .*

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and that job is Wiping!

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4. Super-absorbent and scientifically cleansed to reduce possible infection.
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There's nothing to buy, no expensive inventory—just a low monthly rental. KEX TOWELS are delivered in neat, easily stored bundles, regularly in quantities as desired. This helps you control distribution.

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with special adhesive; flooring nailed to planking. Armstrong Cork Co., Lancaster, Pa.

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"FINISHES FOR ALUMINUM," 124-page illustrated, revised edition. Processes for applying surface finishes, characteristics of finishes, guide for approximating costs, cleaning treatments, other information. Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Ky.

RUBBER STAMP, "Base-Lock." Corrugated rubber base holds interchangeable cast-rubber type. Various sizes, type faces. Self-inking, flat, roll stamps; rocker date and peg stamps. For flat, concave, convex, cylindrical surfaces. Krengel Mfg. Co., 227 Fulton St., New York 7.

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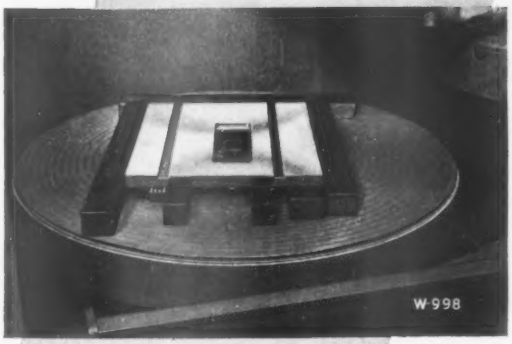
Put it on the Blanchard



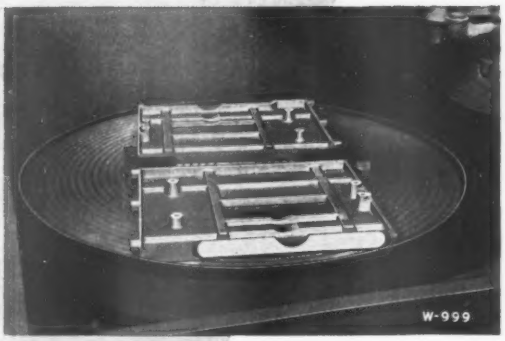
Material: Aluminum Castings

Size: 14¼" x 18"

Held on 36" magnetic chuck on the No. 18 Blanchard Surface Grinder by means of suitable steel or cast iron blocking pieces.

Proper finishing of these aluminum saw table castings required the removal of 1/16" of metal from both sides, to a flatness of .004". The job was put on the Blanchard No. 18 surface grinder in two operation sequences. The broad side is ground first —*to a flatness of .002"*. The flatness and finish of the Blanchard ground surfaces are such that no other finishing or corrective operation is necessary.

They asked for flatness of .004" – They got .002"

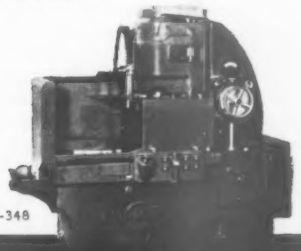


The second operation permits two pieces being laid flat on the chuck, securely held and thus the reverse side is ground to the same flatness limits.

The rate of production is 8½ pieces (17 surfaces) per hour, 8½ of the surfaces being broad and 8½ being narrow or ribbed.

The Blanchard Grinding of these aluminum saw tables was the most economical way to produce smooth flat surfaces and meet customers' limits. In this case Blanchard beat the limits asked for by customer. If the surface must be flat and parallel bring it to the Blanchard for best results.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



BLANCHARD

The **BLANCHARD** MACHINE COMPANY

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131% DIVIDEND

IN ONE YEAR*

The Messinger Mfg. Co., Tatamy, Pa., makers of Insecticide Dusters, Corn-Shellers, Threshers and Woodworking Machinery are reaping the benefits of Turret Lathe Productivity.

131% of the funds invested in Jones & Lamson Turret Lathes were repaid to the purchaser in one year of operation.

*Both large and small lot production of sheaves, bearing caps, blowers, blower cases, worm gear housings, etc., are now turned at peak economy on Jones & Lamson Universal Turret Lathes. One year's savings, based on labor costs alone, more than paid for three machines complete with equipment!

Messinger Mfg. Co., famous for over 90 years' experience in producing agricultural implements, reports that six obsolete lathes were replaced—with capacity to spare. Savings were due to carbide tooling, to the elimination of second operation arbor work (accurate bored jaws were faster and easier) and to the ability of the new machines to hold and repeat exact size settings by means of multiple stops.

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Turret Lathe Division

J&L **JONES & LAMSON MACHINE COMPANY** Springfield, Vermont, U.S.A.

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Heat—Where You Want It. Part of "More Power to America" series. Case histories show industrial applications of tubular, strip, cartridge heaters in heating liquids, surfaces, process air, pipelines, and melting soft metals. General Electric Co., Schenectady 5, N. Y.

Here's Your Worksaver shows tour through plants, warehouses. How to turn invisible losses into profits through adequate materials handling. 16 mm. sound, 15 min. The Princeton Film Center, Princeton 2, N. J.

The Versatile Contour Saw, 16 mm. sound-color-motion film; 48 min. Solutions to many materials cutting problems, band-sawing techniques, methods. *Sawing an Internal Irregular Shape*, 16 mm., sound-motion; 30 min. Sawing technique for simultaneously cutting a punch and die from single piece of steel. *Filing an Internal Irregular Shape*, companion to above. 16 mm., sound-motion; 25 min. Step-by-step method for file-finishing the punch and die on contour band-sawing machine. *Gage Blocks and Accessories*, 16 mm., sound-motion; 25 min. How small mobile inspection unit brings gage blocks, gaging instruments, comparator to point of work; procedure of inspection; record keeping. *The Theory Behind the Use of DoAll Gages*, 35 mm., sound-slide film with records; 26 min. Instruction on choice of gage blocks that are wrung together for combination of given measurements. *How DoAll Gages Are Used*, 35 mm., sound-slide with record; 18 min. Methods of using, inspecting, checking. The DoAll Co., Des Plaines, Ill.

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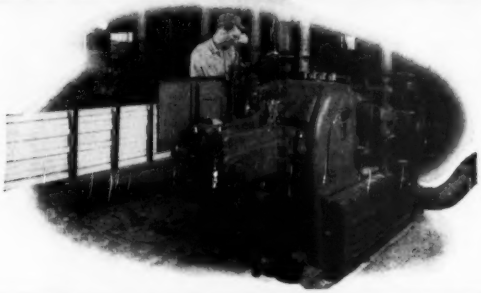

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Which one of the three—engineering, production, lumber procurement—is bothering you? Hines is ready and able to solve any one of your problems as far as wood is concerned—or take over the complete job of wood parts production. We are doing a money saving job for many large manufacturers and are ready to go to work for you. If you are interested in cutting costs, phone, write or wire today!

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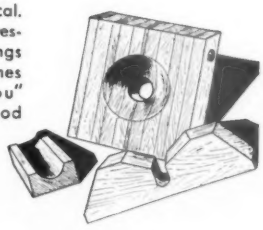

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THE GRINNELL-SAUNDERS DIAPHRAGM VALVE has only one part that normally wears and needs replacement . . . the diaphragm. Depending on the type of service, it may last for years or only months. It can be replaced in just a few minutes. The valve body doesn't have to be removed from the pipe line . . . only the bonnet. The new diaphragm is attached to the bonnet which is then bolted back onto the valve body . . . and the valve is restored to service. That's all the maintenance a Grinnell-Saunders Diaphragm Valve normally needs. No packing glands to demand frequent attention. No refacing or reseating required, because there are no metal-to-metal seats to become damaged or wire drawn.

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NO CORROSION . . . NO CONTAMINATION . . . NO LEAKS . . . The working parts of the valve are completely isolated from the fluid by the diaphragm. Diaphragm materials, body materials and body linings are available to suit service requirements.

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SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Adjunct Professor of Industrial Relations, New York University and a Member of the New York Bar

Period Surveyed: April 1 to May 1

Trend Indicators

Wage Hour

ACTIVITIES MUST BE SPECIFICALLY DESCRIBED TO BE COMPENSABLE

Activities of employees will be held compensable under Section 2 of the Portal-to-Portal Act only if they are specifically described in the contract. The court therefore held that employees were not entitled to compensation for certain preliminary activities where the contract merely provided that "Time and one-half or double time will be paid when required by law or government regulations." While the court held that the Fair Labor Standards Act was incorporated into the contract by reference, no express provision was included covering the particular activities for which the employees sought compensation. Said the court, "The exception of the Portal-to-Portal Act, Section 2, does not apply to any and all activities engaged in by employees, but only to such as are expressly compensable under a written or nonwritten contract or custom or practice in effect covering the activity. In order that activities be expressly compensable under this provision they must be specifically described. A contract which does not refer to and specify the activities for which compensation is to be made does not bring the exception into force." (*In re* Newsom *v.* Du Pont & Co., CCA-6)

EMPLOYER RELYING ON ADMINISTRATIVE RULINGS NOT LIABLE FOR OVERTIME PAYMENTS

Waterfront employers were absolved from liability for overtime payments under the Portal-to-Portal Act, where they relied in good faith upon rulings of the Wage and Hour Administrator that overtime compensation for longshoremen and warehousemen should be calculated on the basis of their straight-time rate of pay. The court further held that the action of the employer in obtaining indemnification agreements from the governmental agencies involved did not negate the claim of good faith reliance upon the administrative rulings. (*In re* Moss *v.* Hawaiian Dredging Co., USDC N. Calif.)

PORTAL-TO-PORTAL ACT DOES NOT BAR ALL OVERTIME

While it is true that under the Portal-to-Portal Act claims are barred if they are not compensated either by virtue of an express contract or by custom or practice, all claims for overtime pay are not barred. (*In re* Michigan Window Cleaning Co. *v.* Martino, CCA-6)

MINOR HELD KNOWINGLY EMPLOYED

An employer was held to have knowingly employed an underage female employee where he had actual knowledge that the employee was only 16 years of age, despite the fact that the employee was referred to the firm by the U. S. Employment Service. The employer was aware of the fact that the employee was under 18 years of age, since when she began her employment on the government work she told not only her floor lady, who hired her, but also the plant manager that she was 16 years old. The court held that the company could not plead it was not liable because the girl was referred to them for the job by USES, an agency of the Government, since USES could not waive the requirement of the company. (*In re* Brook Mfg. Co., Inc., *v.* U. S. Dept. of Labor, Public Contracts Div.)

DEDUCTION OF CONTRIBUTIONS TO PENSION FUND NOT ILLEGAL

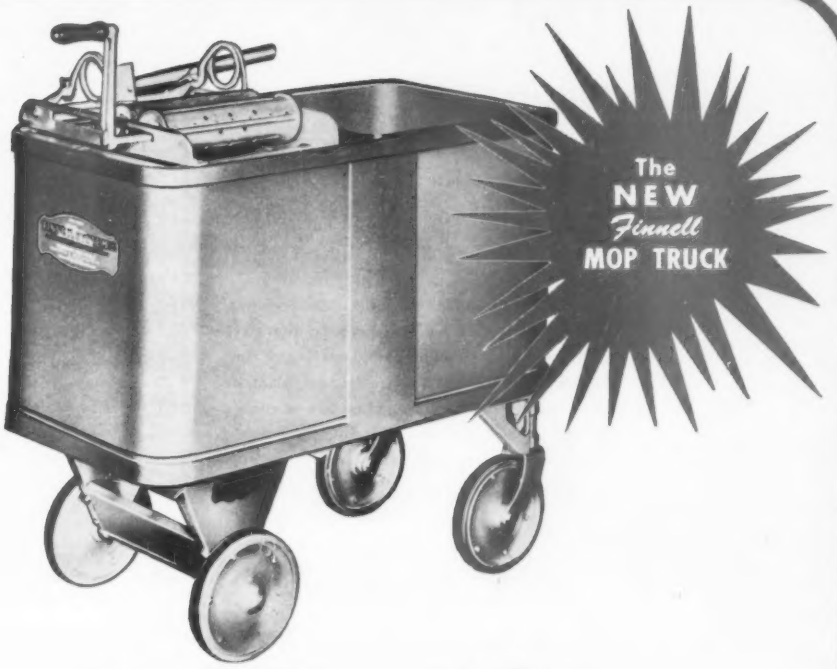
Although the Kentucky statute provides that it shall be unlawful for an employer to withhold wages from employees with the intent to defraud, the court held that a contract provision compelling the employer to withhold from wages the contributions of employees to a pension fund was not illegal under the statute. Despite the fact that the withholding of wages for the pension fund was not expressly authorized by the individual employees, the court pointed out that it was not with an intent to defraud and the statute specifically stated that it does not apply to deductions pursuant to wage contracts. (*In re* Poynter *v.* Louisville Railway Co., Ky. Court of Appeals)

Labor-Management Relations

* EMPLOYER JUSTIFIED IN REDUCING WORK WEEK

An employer was justified in reducing the work week from six to five days, despite the fact that by so doing he deprived employees of the opportunity to receive holiday pay

* In this classification, items marked with an asterisk also are considered to be trend indicators.



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FOR GREATER CLEARANCE... Conserves Storage Space

The new *Finnell* Mop Truck gives you all the fine features of the former *Finnell* truck plus several new ones. The new model has rounded corners and recessed wheels—especially desirable features when the truck has to be moved through narrow passages, and for conserving storage space.

A mop shield beneath the wringer of the truck prevents mop from dropping into the dirty water when being wrung. Wringer-rolls are of steel, and the truck has four double-disc pressed-steel wheels, two of which swivel . . . rubber or metal tires . . . and two 28-gallon tanks. Ruggedly constructed to withstand hard usage. Comes in stainless steel and in galvanized iron.

Finnell also makes a Mop Truck for smaller operations, with two 7½-gallon tanks. The *complete Finnell line* includes *Combination Scrubber-Vacuum Machines . . . Portable Machines* for wet-scrubbing, dry-scrubbing, dry-cleaning, waxing, and polishing . . . *Heavy Duty Vacuum Cleaners* for wet and dry pickup . . . *Steel-Wool Pads* and other accessories . . . *Cleansers, Sealers,* and *Waxes* for every floor-maintenance need.

The nearby Finnell man is readily available to help train your maintenance operators in the proper use of *Finnell Equipment and Supplies.* For consultation or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2506 East St., Elkhart, Ind.
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Plenty of Cool Water
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From the stock-room boy to the skilled worker, plenty of cool water is a daily requisite that pays off in more satisfied employees and better production. The Halsey Taylor line, for plant or office, comprises self-contained coolers or coolers for remote installations, and wall or pedestal fountains for plant or office. Get our catalog.

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COOLER FOUNTAINS

F-3

IT COULDN'T BE DONE...WITH FLAT SLAB CONSTRUCTION

BUT IT WAS!

Third floor view showing upper part of tanks and supporting flanges.

Second floor view showing lower part of tanks and head room. Note the absence of flared column heads, beams and drop panels.

THE SMOOTH CEILINGS SYSTEM of flat slab construction proved ideal for the Archer Daniels Midland Co. installation.

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There are no dust catching, space consuming posts under the tanks which provides a free space for conveyors or other operations that need plenty of head room.

There is a row of heavy machines on one side of the tanks and a battery o. 3 units weighing about 95,000 lbs. each on the other.

The entire load of the tanks and machines is supported only by the Smooth Ceilings System of flat slab construction without beams, caps or drop panels.

For more information on this Archer Daniels Midland Co. installation and complete data on the Smooth Ceilings System—

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SMOOTH CEILING SYSTEMS

802 Metropolitan Life Bldg., Minneapolis 1, Minn.

for two holidays which fell on the sixth day, Saturday. The contract in the instant case provided that employees would receive pay for holidays which fell on Saturday, provided a six-day work week was scheduled. While management may not change the work week in order to avoid paying holiday pay, the arbitrator found that in the instant case, the need for six-day production no longer existed as of the date the employer reduced the work week. Furthermore, said the arbitrator, "The usual assumption is made that holiday pay is given to take the place of earnings which the employee would have received in the ordinary course of life had the holiday been worked instead of celebrated by nonworking. Its purpose is to relieve him from the hardship of reduction of his earnings below the usual, which in some instances might well make the holiday a burden rather than a welcome recess for the working man." Since there would have been no work on the two Saturdays in question even if they were not holidays, employees were not entitled to holiday pay. (*In re* arb. bet. Cherry-Burrell Corp. and United Farm Equipment & Metal Workers of America)

EMPLOYER GUILTY OF BAD FAITH

An employer was guilty of violating the good faith requirements of the Act when he took the position throughout negotiations that he would not enter into a signed agreement. Said the Board, "Since the company's absolute and unyielding principle was at variance with the obligations imposed on it by the Act, the Board's order that it cease and desist was proper." (NLRB *v.* Todd Co., CCA-2)

EMPLOYER GUILTY OF REFUSAL TO BARGAIN

Where an employer questioned a union's majority status when negotiations were near completion and prior to the execution of a contract, the employer was held to have refused to bargain. In holding that the employer's action was in bad faith the Board said, "The determination in cases of this type of the question whether an employer is acting in good or bad faith is, of course, a determination which of necessity must be made in the light of all the relevant facts in the case, including any unlawful conduct of the employer and the sequence of events." In the instant case, the Board found that the employer violated the Act by interrogating employees concerning their choice of a bargaining representative, which questioning was designed and calculated to undermine the union. These past unfair labor practices on the part of the employer and its continuous bad faith in its relations with the employees, indicate that the company's doubt of the union's majority cannot serve as a valid defense to its re-

13 REASONS FOR USING **HARPER** NON-FERROUS AND STAINLESS STEEL FASTENINGS

1. **Resistance to Rust and Corrosion**
2. **Resistance to High Temperatures**
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13. **Resistance to Abrasion and Wear**

Only 1 Reason for Using Common Steel — LOWER FIRST COST

6000 ITEMS IN STOCK. The widest assortment of bolts, nuts, screws, washers, rivets and accessories in Brass, Bronzes, Copper, Monel and Stainless Steels available from one source . . . large quantities of each. Specials made to order from ample stocks of raw materials.

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It's Stainless Steel!

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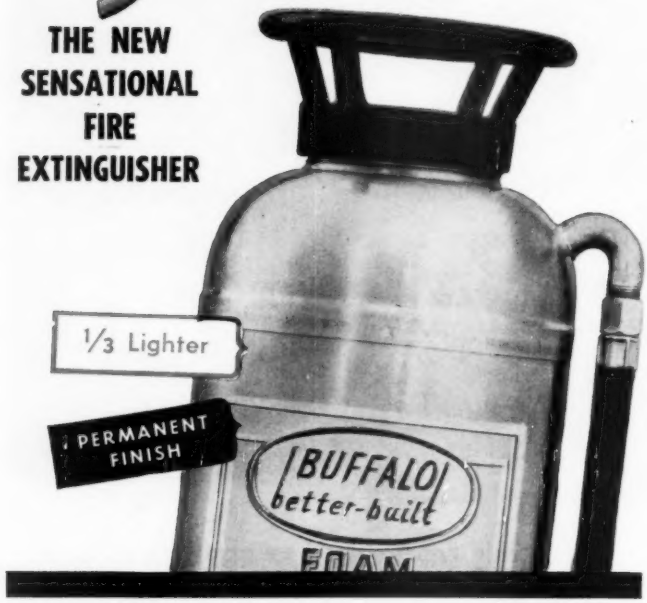

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- **Nearly 7 lbs. lighter — light enough that a woman easily can operate it.**
- **The permanent finish as found only in Stainless Steel. Rustless, Acid-Proof, Corrosion-Proof.**
- **Available in both Soda-Acid and Foam types. Size: 2½ gals.**
- **Approved by Factory Mutual and Underwriters Laboratories.**

Ask your Buffalo representative to demonstrate all of the advantages of this handsome new Buffalo *better-built* Fire Extinguisher that stays gleaming bright. If he isn't listed in the classified section of your phone book, please write us today. You'll want all the facts as quickly as possible.

BUFFALO FIRE APPLIANCE
CORPORATION
DAYTON 1, OHIO
Established 1895

LABOR DEVELOPMENTS *(continued)*

fusal to recognize and bargain with the union. (*In re* Radio Station WSB and Atlanta Local, American Federation of Radio Artists; NLRB)

• EMPLOYER GUILTY OF UNREASONABLE DELAY

Where the contract provided that piece rates for new operations shall be established "without undue delay," an employer's action was held to have constituted unreasonable delay where he didn't announce the piece rates on a new machine until two months after his decision to keep the machine. Since the employees operating this new machine were paid time rates, the arbitrator ordered that they should be compensated for the incentive earnings they lost, retroactive to one week after the employer decided to keep the machine. (*In re* arb. bet. International Harvester Co. and United Farm Equipment & Metal Workers of America)

HELD NOT INTERFERENCE

The National Labor Relations Board ordered that a cease and desist order was not warranted against a firm where the foreman had only warned one employee that if he wanted a wage increase, he should stay away from union meetings. The Board held that this action on the foreman's part did not constitute interference, restraint or coercion within the meaning of Section 8(a) (1) of the Act. (*In re* Sunray Oil Corp. and Oil Workers International Union; NLRB)

• EMPLOYER WHO BY-PASSED SENIOR EMPLOYEE IN PROMOTION MUST SHOW GOOD CAUSE

Where the contract provides that promotions shall be based on seniority and ability, an employer who promoted a junior in preference to a senior employee has the burden of making a prima facie showing of "good cause" for disregarding the rights of seniority. In holding that it was his duty to protect the right of the employee under the contract, the arbitrator said, "I conceive this right to be the right not to be denied promotion based on seniority or discriminatory, arbitrary, or unreasonable grounds, or on grounds which are insufficient because of error or refusal or failure properly to consider his merits. Once the employer has made at least a prima facie showing of good cause for disregarding the rights of seniority, it is the union's duty to show either that the cause established is insufficient under the standards outlined or that the cause advanced is not in fact the true case." (*In re* arb. bet. Public Service Electric & Gas Co. and International Brotherhood of Electrical Workers)

• EMPLOYER REQUIRED TO DISCHARGE EMPLOYEES WHO DO NOT BECOME UNION MEMBERS

Under a union shop contract requiring that "all" nonunion employees presently employed or here-

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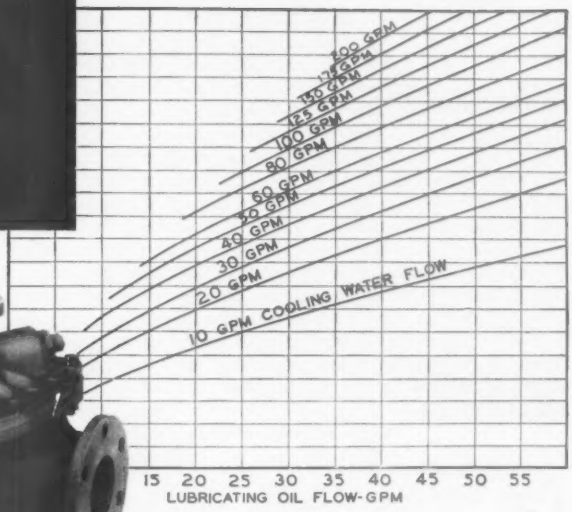

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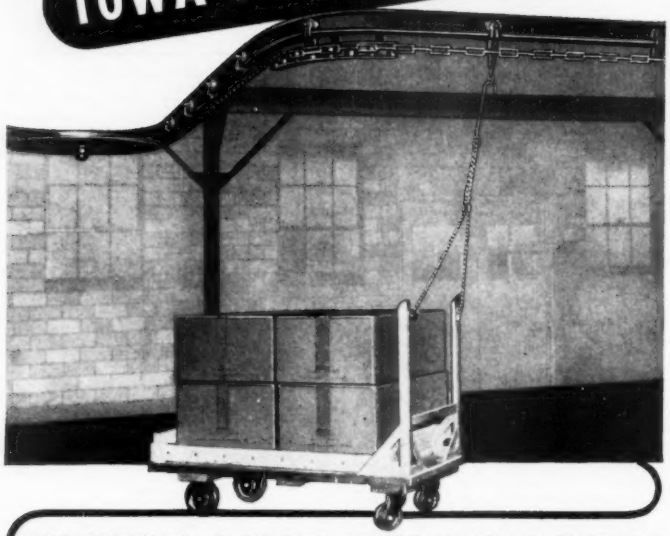

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LABOR DEVELOPMENTS *(continued)*

after hired by the employer shall make application for membership in the union within a specified time and become a member of the union within a certain time, an employer was required to discharge employees who did not become members of the union. The court pointed out that while the employer may hire nonunion personnel, such employees must thereafter become members of the union. Said the court, "That does not make the agreement any the less clear that there is a requirement that the employees become members of the union after employment. The agreement as a whole is a collective bargaining arrangement between the employer and the union as representative of the employees. If the employees were not required to become union members, and the union would represent only union members, there might be little left upon which the agreement could operate where the employer decided to have a wholly nonunion staff." Thus, the court held that while the clause does not require the employer to compel employees he hires to join the union, it does mean that he cannot retain them unless they join the union. (*In re* Silva *v.* Mercier, Calif. Sup. Ct.)

*** EMPLOYER OBLIGATED TO PAY PREMIUM PAY FOR LOSS OF OVERTIME**

An employer was obligated to pay premium pay to employees for loss of overtime, where the employer bypassed these employees in the assignment of sixth-day work. The company contended that it was not obligated to assign overtime work on the basis of seniority, since the seniority provisions apply only to promotions, layoffs, and job preferences when vacancies occur. The union pointed out that after assigning the overtime the employer had admitted an error was made and volunteered to make amends by giving the men involved in this issue a sixth-day work. The arbitrator, in his award, rejected the company's contention that seniority rights should be so limited or restricted. Said the arbitrator, "To adopt such a theory would make meaningless all seniority provisions of a labor agreement." (*In re* arb. bet. Corn Products Refining Co. and United Production Employees Industrial Union)

*** OVERTIME WORK NOT COMPULSORY**

Under a contract designating the regular work week as 40 hours, Monday through Friday, the performance of overtime work on Saturday was held to be voluntary on the part of employees. An employer was therefore unjustified in contending that where workers failed to report for Saturday overtime work, their action constituted a work stoppage. The employer in the instant case refused to pay report time to those workers who did report for Saturday work, claiming that the failure to supply

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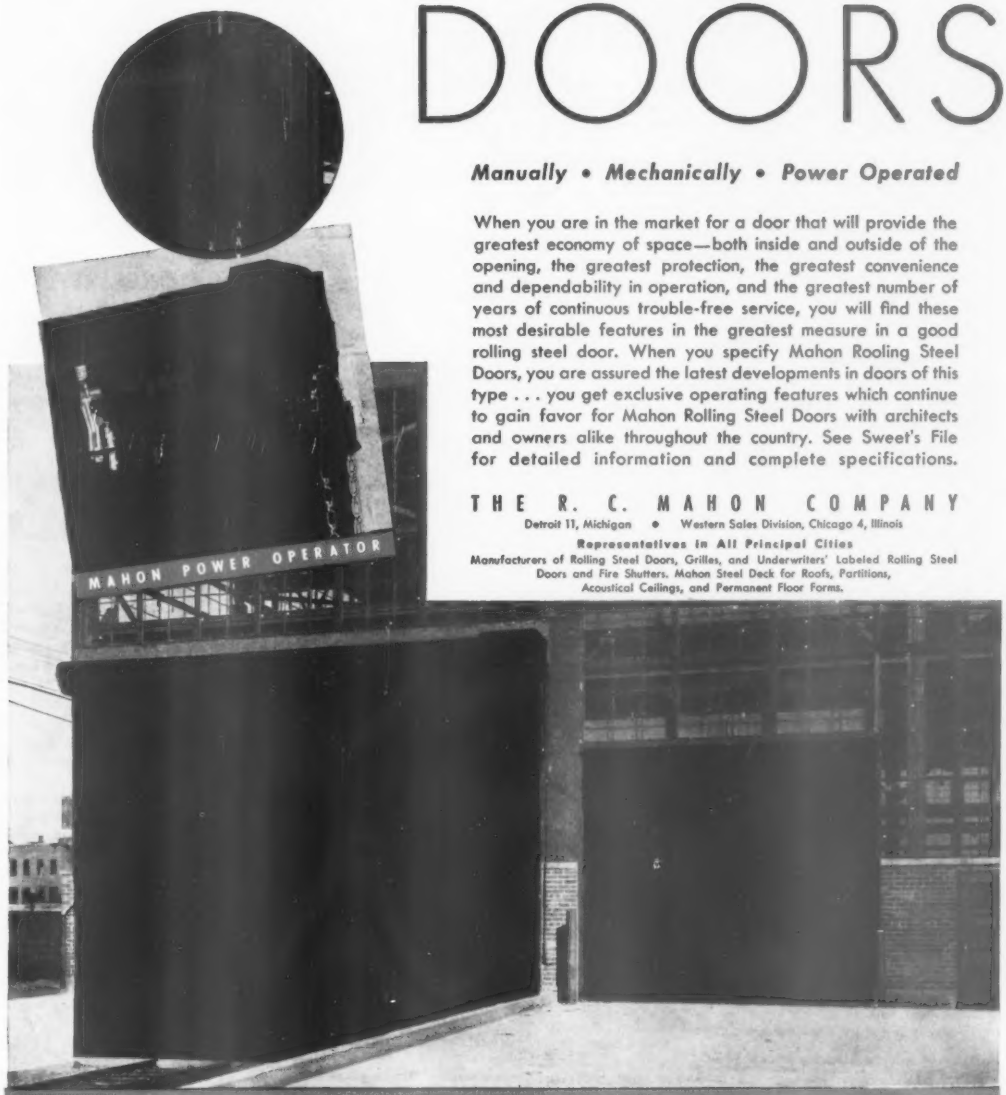

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LABOR DEVELOPMENTS *(continued)*

work was due to a "work stoppage" resulting from the failure of a number of key employees to report. Said the arbitrator: "The company's assumption that the doffers would appear for Saturday work, along with the other employees, was not an adequate basis for terming their failure to appear a 'strike' or 'stoppage of work.' This holds even if there was a 'concerted failure' on the part of the doffers to present themselves for this voluntary work. Clearly no promise of labor performance and therefore no obligation has been broken. For in the agreement, the regular work week is defined as consisting of forty hours, Monday to Friday, inclusive. Other work is overtime.

". . . Where the performance of work beyond the contractual week is a voluntary action, I am unable to construe a refusal to work extra hours as a stoppage or a strike, even if it is concerted action. Employees must be absent from work without permission before a strike or stoppage can be said to exist." (*In re* arb. bet. William Whitman Co., and United Textile Workers of America)

UNION BARRED FROM TAKING DISCHARGE DISPUTE TO ARBITRATION

A union is barred from taking a dispute over the discharge of an employee to arbitration where it entered into an agreement with the employer under the contract's grievance and arbitration procedure whereby the union stipulated that it would not question whether cause existed for the discharge of the particular employer if the employer waited 60 days and was still of the opinion that the discharge was necessary. (*In re* arb. bet. Expert Textile Corp. *v.* Nelson; N. Y. Sup. Ct., Spec. Term, Part 1, N. Y. County)

*** UNION PERMITTED TO FILE GRIEVANCE**

Despite the fact that the union failed to protest like violations of an identical provision of prior contracts, it is not barred from filing a grievance on an occasion of like violation under the present contract. The dispute involved the company's failure to post job vacancies. The arbitrator held that the absence of grievance proceedings prior to the instant one may have meant merely that no employee wished, before the date of the new agreement, to bid for the vacancies. "It by no means follows that failure to present grievances justifies later repetition of conduct violative of an agreement." (*In re* arb. bet. Durham Hosiery Mills and American Federation of Hosiery Workers)

*** UNION MAY FILE FORMAL PETITION WITH BOARD**

Even though an employer was willing to recognize and negotiate with a union which asserted its representative status, the union may still file a formal petition that the National

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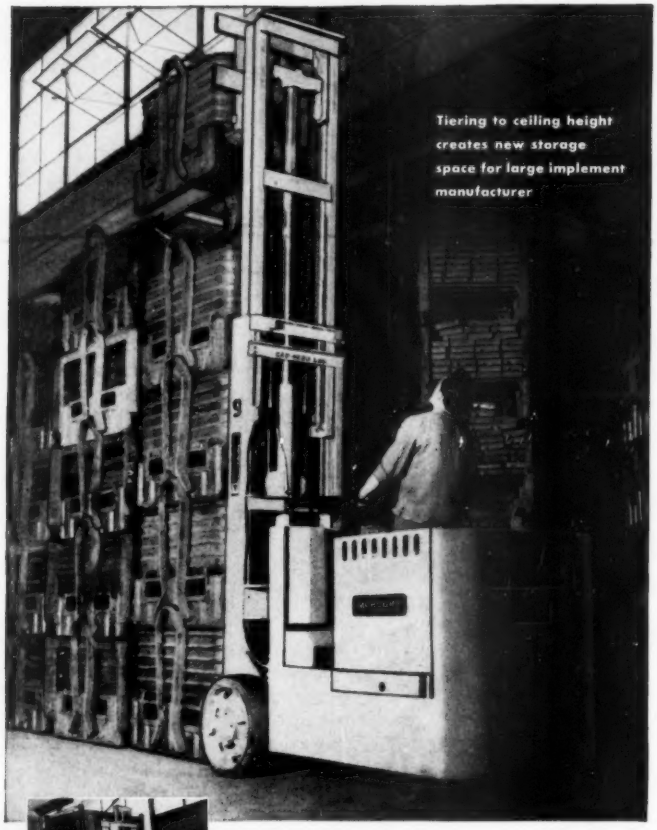

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LABOR DEVELOPMENTS *(continued)*

Labor Relations Board investigate its status by the statutory method of conducting an election. The Board pointed out that it wouldn't be fair to preclude certification of unions, which although they already enjoy recognition, may still desire to be certified in order to secure protection under the Act. In enumerating the advantages which a certified union enjoys, the Board pointed out that a certified union is protected against raiding by another union, only a certified union can lawfully induce the employees of some other employer to engage in a strike or other concerted activity for the purpose of compelling the primary employer to recognize it, and a board certification is a defense in certain situations where a respondent union is charged with engaging in a strike or other concerted activity in support of a jurisdictional dispute. The Board further pointed out in commenting on the statutory privileges and immunities that accompany certification that the "one-year rule" endows a certified union's status with a measure of security and permanence not enjoyed by a union whose majority standing and right to recognition is established otherwise than by Board election and certification. (*In re* General Box Co. and International Assn. of Machinists and International Union of Operating Engineers; NLRB)

HELD NOT ARBITRABLE

An arbitrator refused to consider as arbitrable a dispute over the union's right to examine the employer's books for the purpose of checking the correctness of the employer's payroll reports under a contract providing for group insurance. Under the agreement the employer was required to furnish the union and the insurance fund with a list of employees, social security numbers, and such other information as may be required by the underwriting insurance company for the purpose of keeping accurate records, and the arbitrator found that at no time did the employer fail to furnish all the information requested or required. The arbitrator further pointed out that there was nothing in the agreement which required an employer to permit an audit of his books, and since there were only 60 employees in the company, the union could easily check the reports with the 60 employees involved. (*In re* Sohmer & Co., N. Y. Sup. Ct., Spec. Term, Part 1, Queens County)

FEMALE EMPLOYEES NOT ENTITLED TO MALE RATE

Female employees who replaced male employees were not entitled to the same rate paid to the men, since the job performed by the women differed from the one formerly held by men because of the introduction

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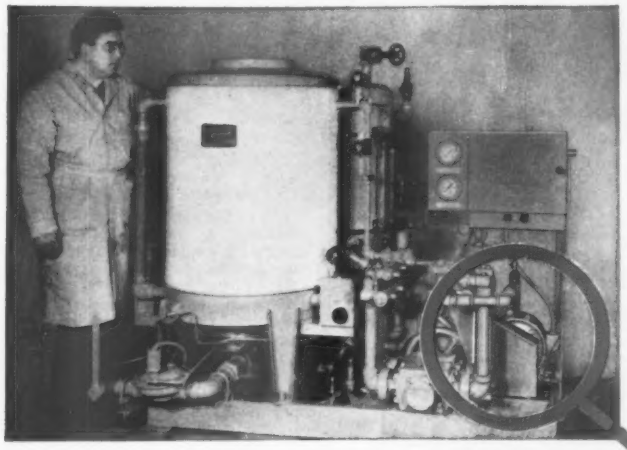

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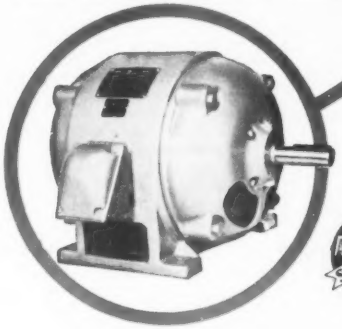

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LABOR DEVELOPMENTS *(continued)*

of a new type of machine. The arbitrator held that the contract clause entitling women who "fully replace" male employees to the rate paid men was designed to assure the payment of male rates to female employees, provided the females in question perform the entire job as it was performed by the males who were replaced. (*In re* arb. bet. Timken Roller Bearing Co. and United Steelworkers of America)

SPECIAL AGREEMENT HELD BINDING

Where the company and the union negotiated a special agreement following the expiration date of the old contract and prior to the effective date of the new contract, which agreement applied specifically to piece rates for one incentive job, the agreement was held to be binding on the parties. The arbitration board pointed out that when the parties negotiated the special agreement, they meant it to cover every aspect of adjustments of piece rates on one type of work. In the event that the dispute had arisen prior to the time the new contract was signed, but after the special agreement was negotiated, it would certainly have been settled under the latter. Therefore, said the arbitrator, "It would appear that during that period and therefore at the time of its negotiation, the parties would have been necessarily confined to the application of this separate provision. Intent at the time of negotiation is determining unless subsequent dealings show a change in such intent mutually agreed to. Certainly the collective contract shows no such intent." (*In re* arb. bet. Hercules Steel Products Corp. and International Assn. of Machinists)

* PETITION BY NONCOMPLYING UNION CONSIDERED IN DECERTIFICATION ELECTION

While the Board will not consider the claim of a noncomplying union in a case involving an affirmative petition for certification, the Board did consider the objections of a noncomplying union in a decertification election. In the latter type of case, the Board pointed out, the noncomplying union is not attempting to avail itself of the Board processes, but is made a necessary party by virtue of its claim that the union no longer represents a majority of employees in the appropriate unit. Said the Board, "We have held that, as the question concerning representation in a decertification case is raised by individuals and not by a labor organization, Section 9(f) and (h) of the Act do not prevent the Board from proceeding with the investigation and resolving the representation question by conducting an election in which a noncomplying union's name appears on the ballot." (*In re* Unvis Lens Co. and Dwight Ludwick and United Electrical, Radio & Machine Workers of America)

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February 24, 1949

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The above facts may seem extremely complimentary and, frankly, they are intended to be, for the Udylite fully-automatic plating machine is one of our proudest possessions and one which has certainly paid off in quality, productivity, and dollars' and cents' savings.

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Dunstan S. Gross

Dunstan S. Gross
Factory Manager

D. S. Gross, Factory Manager, explains plating operations to Friden Detroit Representatives P. E. Strom and P. Pattyn.

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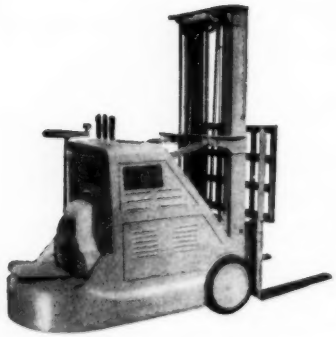

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THEY SAY AND DO

School's Atomic Program Gains Industry Support

International Harvester Company has joined the University of Chicago's $12-million basic atomic and metal research program. International Harvester's contribution to the University's Institute of Radiobiology and Biophysics was $20,000.

The reason given by the company for its action was its belief that "atomic science may play a major role in food production."

Fifth Industrial Peace Study Released by NPA

The Sharon Steel Corporation, Sharon, Pa., is the object of the fifth in a series of fifteen projected surveys made by the National Planning Association on the causes of industrial peace. In a report recently released, company firmness and open dealings, and cooperation between management and labor leadership were listed as factors in twelve years of unbroken peaceful relations in the company.

Sharon Steel has had no strike or work stoppage due to internal disagreement. Every grievance has been adjusted without resort to arbitration, and "not a single dispute at Sharon was referred to the War Labor Board during World War II." During the general steel strike in 1946, however, operations were halted, but the relationship between the company and the union remained friendly. The union involved is United Steel Workers of America, CIO.

The survey cited a dozen "internal" reasons for good labor relations at Sharon Steel. Two were shared by management and labor, six were credited to management, and four dealt specifically with factors of labor leadership.

These causes are as follows:

Joint Responsibility:

1. The fact that the relationship was established and the original agreement signed (twelve years ago) without bitterness and strife.
2. Effective communications and consultation between the parties.

Management Responsibility:

1. Management's flexibility — its willingness to experiment, to adjust, and even to improvise.
2. Management's firmness — it doesn't give anything to the union merely for the sake of avoiding a scrap.
3. Management's sustained effort to encourage a strong and responsible union.
4. Management's dissemination of its policies and practices to lower levels.
5. Cooperation between line and staff personnel.
6. Management's prior consultation with union representatives regarding changes in policies and procedures.

Union Responsibility:

1. The high caliber of local union leadership.
2. Responsible character of the union—its respect for its commitments and legitimate obligations.
3. The union's efforts to avoid factionalism within or between the locals.
4. Union's efforts to increase the responsibility and authority of local union officials.

New Job Dictionary Published

McGraw-Hill Washington News Bureau

If you are laying off or hiring workers more frequently these days, you will welcome the second edition of the Dictionary of Occupational Titles being put out in June by the United States Employment Service.

It lists definitions and titles of jobs in some of the newer industries —plastics manufacturing, electrical and radio equipment, pulp and paper manufacturing—not included in the first edition issued in 1939. One exception: atomic energy jobs. Reason: So much atomic work is secret.

USES hopes that many of the 75,000 copies of the first edition will be replaced by the industrial firms, government agencies, employment offices, unions, colleges, and others using them.

The new edition, in two volumes, will be available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. The first, selling for $3, contains the 22,000 definitions in alphabetical order according to job titles. The 22,000 jobs are known by 40,000 different titles.

Volume two, costing $2.50, is in five sections. It lists jobs and job groupings; defines 250 industries and the specific jobs assigned to them, and contains a glossary of terms. Also included is an index of common commodities sold in wholesale and retail trade, to facilitate the classifying of persons in sales jobs.

The new edition eliminates obsolete and duplicate definitions of jobs contained in the first edition. It uses a new method in presenting job definitions, eliminating many cross references and simplifying use of the dictionary as an aid in job classification, employment counseling, and placement of workers.

The jobs are divided into seven

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major occupational groups: (1) professional and managerial; (2) clerical and sales; (3) service; (4) agriculture, fishery, forestry, and kindred work; (5) skilled, (6) semi-skilled, and (7) unskilled.

Information Wanted on Pallet Standardization

The Standards Association of Australia was recently appointed by the International Organization for Standardization as secretariat for I.S.O. Technical Committee 51 to consider the standardization of pallets for the unit load method of materials handling. Australia is one of the few countries that has endeavored to standardize handling methods and equipment. Though many sizes have been used by various organizations, most eventually turn to the standard sling pallet, nominally 48 inches square.

All persons interested in the subject of pallet standardization are invited to forward correspondence and information to the Secretary, Committee on Pallets for Unit Load Methods of Materials Handling, Standards Association of Australia, Science House, Gloucester St., Sydney.

NEMA Develops New Salaried Job Rating Plan

A new Salaried Job Rating Plan for clerical, supervisory, and technical positions has been announced by National Electrical Manufacturers Association. This point rating plan is similar to NEMA's Job Rating Plan for Hourly Rated Jobs, first published in 1937. The salaried plan has been published in two volumes.

Spokesmen for the plan say it is simple to understand, readily applied, and dependable in its results.

The number of factors for nonsupervisory jobs has been held to six in order to keep it as simple as possible. Two factors have been added for supervisory jobs.

The specifications for each factor and for each degree thereof have been carefully developed. Like the plan for rating factory jobs, it furnishes a method for establishing and maintaining fair salary differentials within and between jobs, based on differences in the relative requirements of the jobs.

The plan is supplemented by a Manual of Procedure, which presents in clear, easily understood outline form the successive steps involved in the installation and application of the plan from start to finish. The topics covered are: principles of sound salary administration, steps in applying the plan, developing job descriptions, rating the jobs, developing a salary schedule, putting the plan into effect, job rating specification sheets, in-

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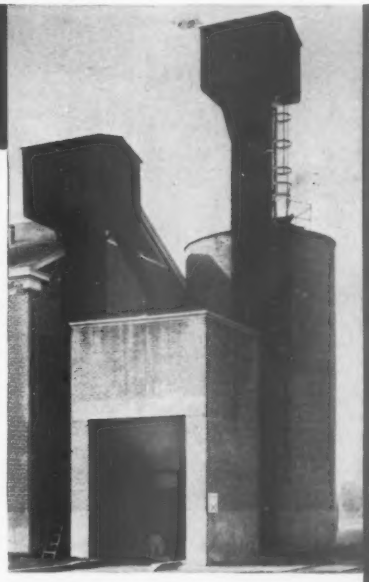

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cluding samples for 20 typical jobs rated in accordance with the plan.

Training Institutes Being Prepared

To stimulate continued and increasing interest in and use of the plan, a series of area training institutes is being planned for 1949 and 1950.

Attendance at each institute will be limited to approximately 35 persons, thus providing the fullest opportunity for questions and answers and for intimate discussion. Those attending will be given actual practice in writing job descriptions and rating jobs. Every step in the application of the plan will be thoroughly explained, with ample opportunity for group and individual participation. There will be opportunity to discuss such things as the problems of integrating the plan into the specific company's present system. NEMA members will have attendance priority.

Each institute will be directed by A. L. Kress, NEMA consultant on job rating and author of FACTORY's Plant Operation Library No. 38, "How to Rate Jobs and Men."

Power Truck Safety Code Drafted

As reported at the Greater Chicago Midwest Safety Conference in May, a safety code for power trucks has been prepared by a committee organized under American Standards Association procedures, consisting of representatives of truck users, government agencies, manufacturers, labor organizations, and qualified experts.

The preliminary draft of the code consists of two parts, the first dealing with design phases and the second concerned primarily with the operation and maintenance of equipment.

Under the code, trucks have been given a uniform capacity rating in place of the former variable bases of rating used by individual manufacturers. The code suggests some minimum requirements as to the strength needed on certain guards and ways of meeting unusual hazards. Standardization of controls was one of the most difficult problems because there is at present so much variation, and a changeover to standard control arrangements will be slow and costly. However, accident reports indicate that lack of uniformity of controls does represent an accident hazard.

The second section of the code recommends operating and traffic rules and indicates minimum physical requirements for operators.

Since the code is sponsored by the American Society of Mechanical Engineers and the American Standards Association, there will be a continuing code committee ready to consider recommendations for changes in the code.

THE SHOP FOREMAN of Hart Pressed Steel Corp., Elkhart, Indiana, exposes the clean metal surface beneath a coating of Stanorust 1-XC Rust Preventive. The die shown has been protected against rust under severe outdoor conditions for over a year by Stanorust 1-XC.

How to prevent rust under severe outdoor conditions...

Rain, snow, heat, cold—plus coal soot from passing locomotives—could be expected to produce serious rust troubles in outside storage. The elements did, indeed, cause difficulties for the Hart Pressed Steel Corp., Elkhart, Indiana, which owns the truck and trailer dies shown above. Despite coatings of heavy oil, rusting was so severe that cleaning a die required at least three hours.

The problem was laid before a Standard Oil Lubrication Engineer. He pointed out that, to withstand severe outdoor exposure, a rust preventive with special qualities is needed. At his suggestion, the dies were coated with Stanorust 1-XC, a rust preventive especially developed for severe outdoor service.

Stanorust Rust Preventives

Use of Stanorust instead of the less expensive oil has made savings for this company. Many of the dies have been exposed to the weather for over a year, yet Stanorust has kept them completely protected against rust. A die can now be cleaned and returned to service in a matter of ten minutes, as compared with the three hours previously required.

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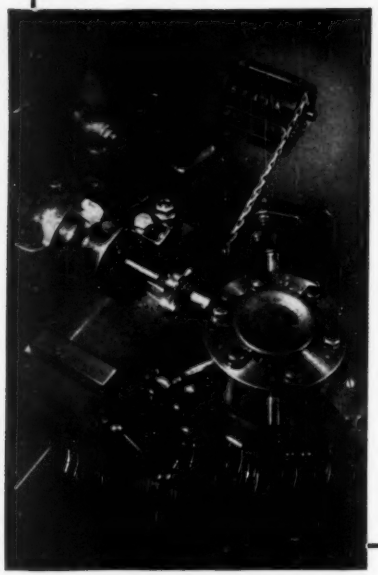

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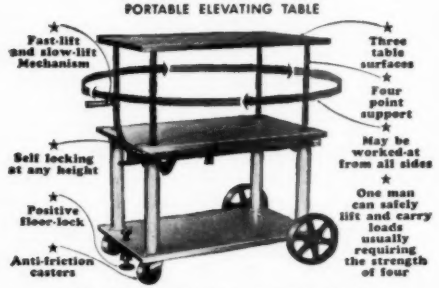
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BEHIND THE BYLINE

Facts About *Factory's* Authors

(Received too late for inclusion in the May issue.)

E. W. Hamlin (author of "Waste Reduction Campaign Hits Million - Dollar Jackpot," May, page 102) is a native Akronite, joined The Goodyear Tire & Rubber Company in 1934 as a member of the co-op training program while still attending Akron University. After graduation, he remained with the organization as supervisor. In 1939 he became a member of the production squadron, a training organization which has developed key executives from vice presidents to section heads. In '42 he left to become an airship test and ferry pilot under U.S. Navy direction, then was named pilot and personnel manager at the Wingfoot Lake Airship base.

Frederick G. Rudge (page 66), consultant in management and community relations, was born in Mt. Vernon, N. Y., received his B.S. in 1933 from Columbia University where he was a member of Phi Betta Kappa. He was one of the founders of William E. Rudge's Sons, Inc., specialists in the printing of fine editions and public relations messages. He is a member and past director of the N. Y. Employing Printers' Association, director of the N. Y. Association of the Blind, vice president of the National Management Council, and member of the American Institute of Graphic Arts.

Marvin Mundel (page 84) received his early industrial training with a gasket company and a radio tube and miniature lamp plant. He holds degrees from New York University and the University of Iowa, has taught at Bradley Polytechnic Institute and at the University of Iowa. He is now professor of industrial engineering at Purdue, where he is in charge of the work in motion and time study as well as graduate research in industrial engineering. He is the author of "Systematic Motion

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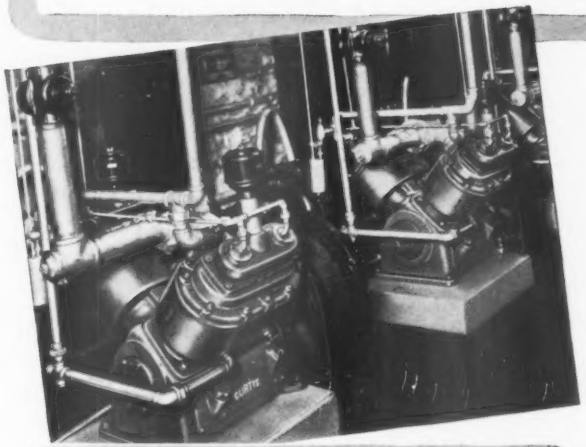

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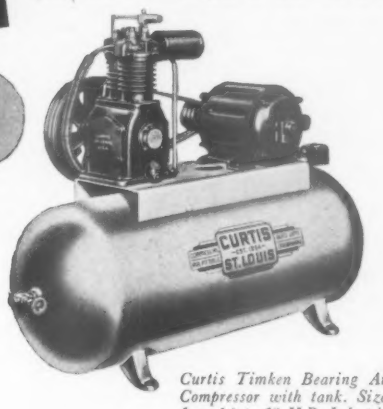

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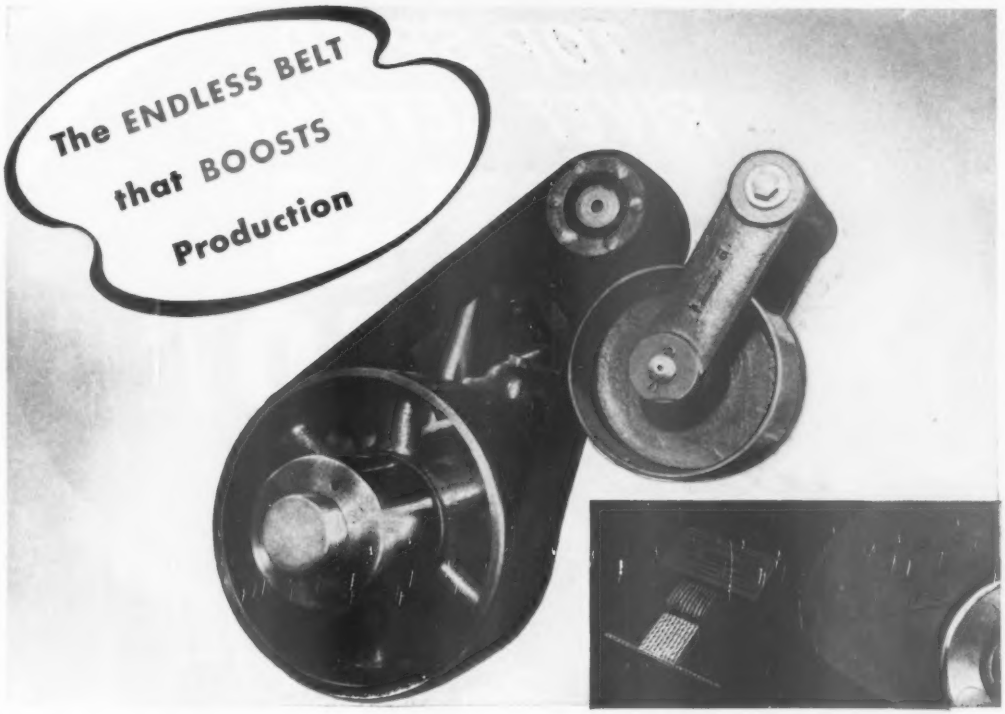
and Time Study" and numerous articles, several of which have appeared previously in FACTORY.

A. W. Leeseberg (page 86) has spent the past forty-one years with the American Stove Company of Cleveland. Beginning as a young lad, he was soon promoted to office boy, then to various factory office positions. For approximately twenty years prior to the war he was superintendent of the porcelain enamel department. During the war he acted as production manager, and is now manager of the Cleveland plant.

Professor of Industrial Engineering and director of personnel at Iowa University's College of Engineering, Ralph M. Barnes (page 90) received his M.S. and Ph.D. degrees from Cornell University. A previous contributor to FACTORY ("Work Measurement," Plant Operation Library No. 95, June, 1946), he has directed special courses in management and in quality control by statistical methods since 1939. He is a member of the American Management Association, the Society for the Promotion of Engineering Education, Institute of Industrial Psychology of Great Britain, and the American Association for the Advancement of Science.

John J. Daly (page 114) came directly to the McGraw - Hill Book Company from New York City's High School of Commerce in 1925. After gaining experience in the many phases of the shipping department, he was appointed manager of the unit in 1936. During World War II he served for two years in the Army Transportation Corps under General Kilpatrick of Madison Square Garden fame. One of his many hobbies is bowling, and he was instrumental in organizing the McGraw-Hill Building Bowling League, now in its sixteenth year.



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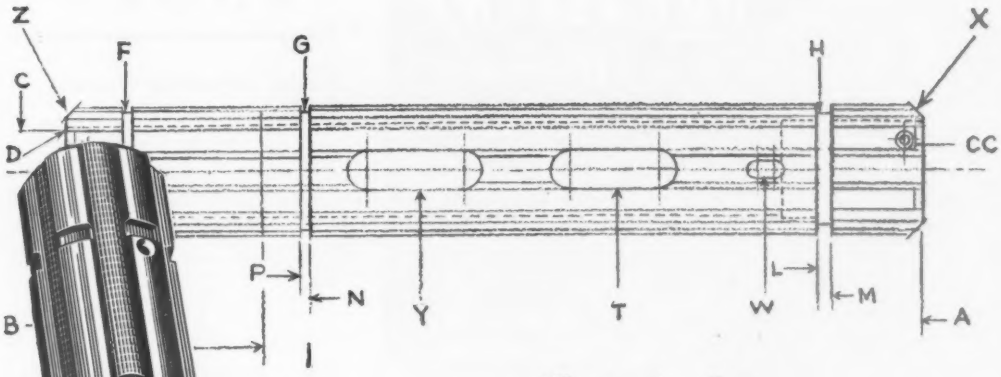

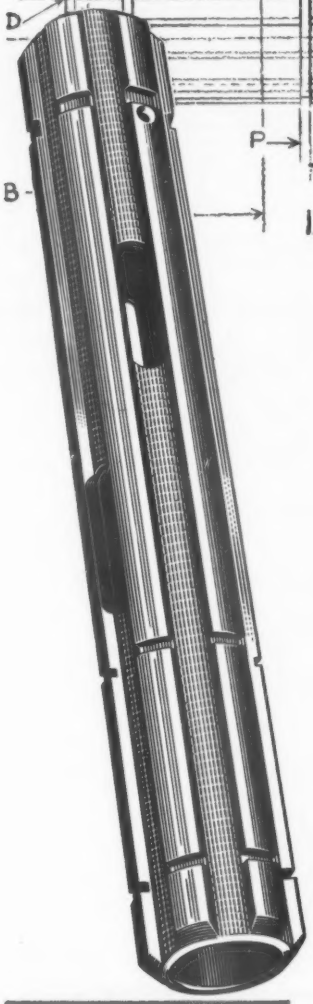

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Power Capacitors

H. E. MARBURY, Westinghouse Electric Corp. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 205 pp. Photographs, tables, diagrams, graphs. $3.50.

Covers the fundamental working principles of capacitors, materials used in the manufacture of power capacitors, and the characteristics of the completed units. History and development of power capacitors and applications to power systems are discussed; also types of capacitors commonly manufactured and their respective fields of application. Material is presented in a manner readily understandable to engineers.

Trolley Conveyors

SIDNEY REIBEL, materials handling consultant, Albert Kahn Associated Architects and Engineers. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 265 pp. Photographs, tables, diagrams. $4.00.

This manual covers all types of trolley conveyors, discusses effective design and proper selection for specific needs, from laying out the path of a conveyor to operational and maintenance techniques. Quick reference tables give statistics on chain strengths and sizes, power requirements for drive, and other information.

Personnel Selection: Test and Measurement Techniques

ROBERT L. THORNDIKE, professor of education, Teachers College, Columbia Univ. John Wiley & Sons, Inc., 440 4th Ave., New York 16. 358 pp. Tables formulas. $4.

Critical analysis of the basic logical and methodological problems involved in testing and the reasoning behind formulas used. The book also discusses basic steps required to set up and administer a personnel selection program.

Mathematics for Electricians

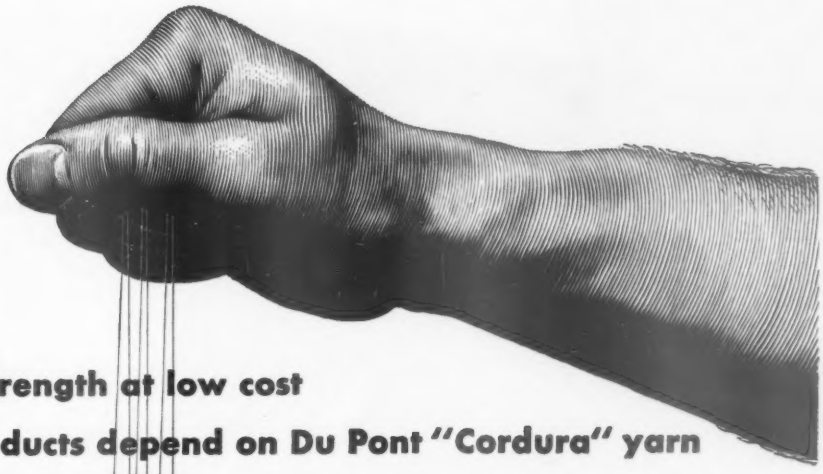
MARTIN M. KUEHN, principal, Technical High School, Buffalo, N. Y. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. 372 pp. Diagrams, photographs, mathematical tables. $2.80.

New third edition of textbook brings material up to date, includes section on alternating current and revised material on power. Problems and answers.

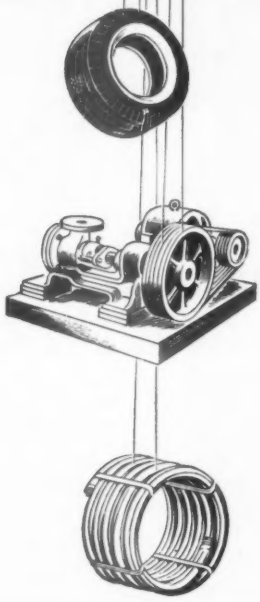
NEMA Salaried Job Rating Plan

Industrial Relations Dept., National Electrical Manufacturers Assn., 155 E. 44th St., New York 17. 10 pp. $10, first copy; additional copies, $5 each.

This is a point rating plan, similar



For high strength at low cost these products depend on Du Pont "Cordura" yarn



To build strength into tires, V-belts and many types of hose, more and more manufacturers are using Du Pont Cordura* High Tenacity Rayon.

"Cordura" yarn is engineered to provide strength in a small package . . . and at a low cost. It's inherently stronger than yarn made of other fibers commonly used. Because less "Cordura" is needed to attain a desired strength, manufacturers can often reduce raw material costs . . . as well as improve their products.

Cooler-running tires . . . hose that's lighter and easier to handle . . . V-belts that transmit more power, require less maintenance, have longer life . . . these are some of the results of using "Cordura."

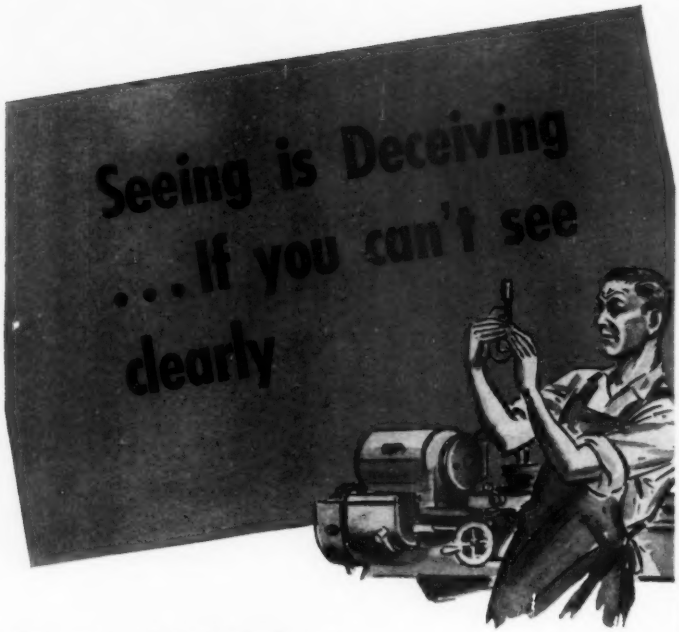
Since "Cordura" is a man-made fiber, it offers the important advantage of unvarying uniformity. And it is composed of continuous filaments—no short pieces to pull apart under strain.

*REG. U. S. PAT. OFF.

Let us help YOU profit with "Cordura"

Inherently stronger than natural fibers commonly used, and usually more economical, "Cordura" is a yarn you can't afford to overlook. Perhaps the uses described above suggest still another application to you. Write us about it . . . and tell us if you need data on the performance of this yarn under unusual operating conditions. We'll be glad to give you a detailed analysis of the application you have in mind, along with other helpful information. Write Rayon Div., E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

for RAYON . . . for NYLON . . . for FIBERS to come . . . look to DU PONT



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to the NEMA Job Rating Plan for Hourly Rated Jobs. The number of factors for nonsupervisory jobs has been held to six, with two factors added for supervisory jobs. The plan furnishes a method for establishing and maintaining fair salary differentials within and between jobs, based on differences in their relative requirements. Companion book described below.

Manual of Procedure for Use of NEMA Salaried Job Rating Plan

Industrial Relations Dept., National Electrical Manufacturers Assn., 155 E. 44th St., New York 17. 62 pp. Tables. $10, first copy; additional copies, $5 each.

The manual presents in clear outline form the successive steps involved in the installation and application of the plan. Seven principal parts: principles of sound salary administration; steps in applying the plan; developing job descriptions; rating the jobs; developing a salary schedule; putting the plan into effect; job rating specification sheets, including samples for 20 typical jobs. See companion book above.

History of the Tools Divisions, WPB

BRADLEY STOUGHTON, Ph.B., B.S., D.Eng. McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 154 pp. Photographs, charts, graphs. $4.

Intimate record of the activities of the Tools Division, including personal notes and photographs of those especially active in the work. Includes suggestions for betterment in any future emergency.

BOOKLETS

NATIONAL APPRENTICESHIP AND TRAINING STANDARDS FOR THE SHEET METAL INDUSTRY. Standards approved by the Sheet Metal Contractors' National Assn., Inc., and the Sheet Metal Workers' International Assn., AFL. Bureau of Apprenticeship, U.S. Dept. of Labor, Washington 25, D.C. 32 pp. No charge.

THE NATURE OF MANAGEMENT. Occasional Papers No. 2. Sir Charles Renold. J.P. British Institute of Management, 17 Hill St., London W 1. 2/6.

THE HUMAN RACE. Statistics on traffic accidents. Travelers Insurance Companies, Hartford, Conn. 30 pp. Cartoons, tables. No charge.

WHO DOESN'T WANT MORE? Tells employees how machines help them earn more. National Assn. of Manufacturers, 14 W. 49th St., New York 20. 16 pp. Cartoons. 3.1¢ each, under 100 copies; lower price for quantity orders.

IF PRICES AND SALES DROPPED X%. Review of position of businessman today. Research Institute of America, Inc., 292 Madison Ave., New York 17. 32 pp. Charts, tables. Individual copies available from Membership Relations Division.

PIPES, DUCTS, AND FITTINGS FOR WARM AIR HEATING AND AIR CONDITIONING. Revision R207-49 of "Simplified Practice Recommendation." Commodity Standards Division, National Bureau of Standards, Washington 25, D.C. Mimeographed. No charge.

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BOR LEGISLATION. Personnel Series No. 125. Papers presented at the Mid-winter Personnel Conference, 1949. 44 pp. American Management Assn., 330 W. 42nd St., New York 18. 75¢.

THE FILM IN INDUSTRIAL SAFETY TRAINING. Paul R. Ignatius, instructor in business administration, Graduate School of Business Administration, Harvard Univ. Division of Research, Graduate School of Business Administration, Harvard Univ., Boston 63. 119 pp. $1.50.

PROBLEMS OF GROWTH IN INDUSTRIAL UNDERTAKINGS. Winter Proceedings 1948-49, No. 2. L. Urwick. British Institute of Management, 17 Hill St., London W 1. 43 pp. Charts. 5/-.

THE ORGANIZATIONAL STRUCTURE OF LARGE UNDERTAKINGS: MANAGEMENT PROBLEMS. Winter Proceedings 1948-49, No. 3. Sir Charles Renold, J.P. British Institute of Management, 17 Hill St., London W 1. 39 pp. Chart. 2/6.

THE GIFT OF FREEDOM. A study of the economic and social status of wage earners in the U.S. U.S. Dept of Labor, Bureau of Labor Statistics. Supt. of Documents, U.S. Govt. Printing Office, Washington 25, D.C. 142 pp. Tables, photos, charts, sources of information. 55¢.

THE FIA STORY. Fire insurance for industrial plants. Factory Insurance Assn., Hartford, Conn. 24 pp. Photos No charge.

THERMAL TEST COEFFICIENTS OF ALUMINUM INSULATION FOR BUILDINGS. Report on heat reflectivity, Gordon B. Wilkes, Massachusetts Institute of Technology, P. G. Hechler and E. R. Queer, Pennsylvania State College. 32 pp. Illustrated. Infra Insulation, Inc., 10 Murray St., New York 7. No charge.

THE GREAT ILLUSION: AN INEXHAUSTIBLE PUBLIC PURSE. Supplement to "Can Uncle Sam Do It Better?" Economic Policy Division Series No. 8. Thomas S. Holden, chairman. Federal Grants-in-Aid Subcommittee of the NAM Government Spending Committee. National Assn. of Manufacturers, 14 W. 49th St., New York 20. 22 pp. Mimeographed; charts, tables, appendixes. No charge.

PLANT LAYOUT: TEMPLATES AND MODELS, 1949. ASME Plant Layout and Standards Committee, American Society of Mechanical Engineers, 29 W. 39th St., New York 18. 8 pp. 40¢.

EMPLOYEE-BENEFIT PROVISIONS. Selected excerpts from collective bargaining agreements. Mimeographed. 74 pp. U.S. Dept. of Labor, Bureau of Labor Statistics. Washington 25, D.C. No charge.

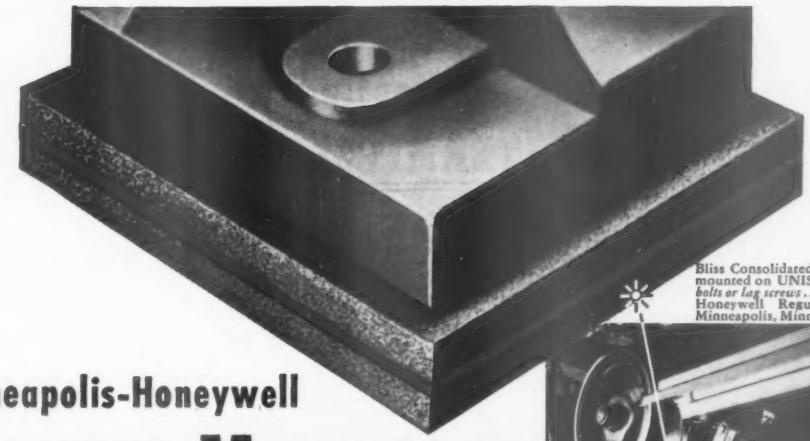
MANAGEMENT PROBLEMS IMPLICIT IN MULTI-EMPLOYER BARGAINING. Sylvester Garrett and L. Reed Tripp. Industry-Wide Collective Bargaining Series. Univ. of Pa. Press, 3436 Walnut St., Philadelphia 4. 61 pp. $1.

ON THE CALENDAR

JUNE

1-3. American Leather Belting Association, Spring Meeting; Shawnee Inn, Shawnee-on-the-Delaware, Pa. E. R. Rath, Executive Vice President, 41 Park Row, New York.

5-10. The Society of Automotive Engineers, Semi-Annual Meeting; French Lick Springs Hotel, French Lick, In-



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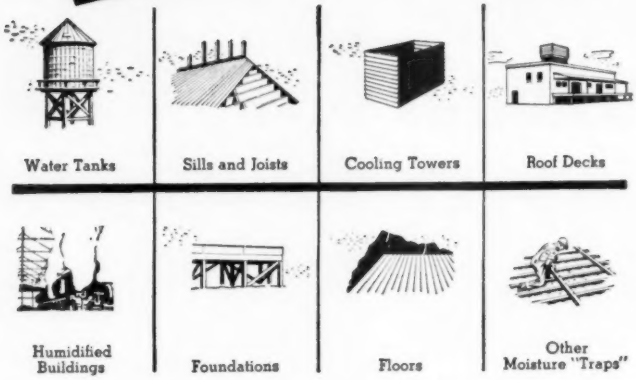

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diana. John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York 18.

5-9, American Society of Refrigerating Engineers, Spring Meeting; River Cruise on the St. Lawrence and Saguenay Rivers, starting from Montreal. Burgess S. Jennings, President, 40 West 40th St., New York.

6-8, Industrail Recreation Association, Annual Conference; Book-Cadillac Hotel, Detroit, John W. Fulton, Executive Secretary, 185 No. Wabash Ave., Chicago 1.

8-9, American Management Association, General Management Conference; Waldorf-Astoria, New York. James O. Rice, Manager, 330 West 42nd St., New York 18.

14-15, Third Annual Institute for Public Relations; Kent State University, Michael Radock, Executive Secretary, Kent, Ohio.

19-22, National Association of Cost Accountants, Annual Meeting; Palmer House, Chicago. Arthur Gunnarson, Secretary, 385 Madison Ave., New York.

20-22, American Society of Heating and Ventilating Engineers, Semi-Annual Meeting; Hotel Nicollet, Minneapolis. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

20-22, National Association of Purchasing Agents, Annual Convention; Stevens Hotel, Chicago. G. A. Renard, Executive Secretary-Treasurer, 11 Park Place, New York 7.

20-24, American Institute of Electrical Engineers, Summer General Meeting; New Ocean House, Swampscott, Mass. H. H. Henline, Secretary, 29 West 39th St., New York 18.

20-24, The American Society for Engineering Education, Annual Meeting; Rensselaer Polytechnic Institute, Hotel Hendrik Hudson, Troy, N. Y. Arthur Bronwell, Secretary, Northwestern University, Evanston, Ill.

27-30, American Society of Mechanical Engineers, Semi-Annual Meeting; Extension Building, University of California, San Francisco. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.

27-July 1, American Society for Testing Materials, 52nd Annual Meeting; Chalfonte-Haddon Hall, Atlantic City. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

JULY

20-23, Silver Bay Conference on Industrial Relations, 31st Annual Conference, Silver Bay-on-Lake George, N. Y. William F. Meyer, Executive Secretary, 347 Madison Ave., New York.

AUGUST

22-26, National Association of Power Engineers, Inc., 48th National Power Show and Convention; Hotel Sherman, Chicago. John C. Toohy, Exhibit Manager, 176 W. Adams St., Chicago 3.

23-26, American Institute of Electrical Engineers, Pacific Coast General Meeting; Fairmont Hotel, San Francisco. H. H. Henline, Secretary, 29 W. 39th St., New York 18.

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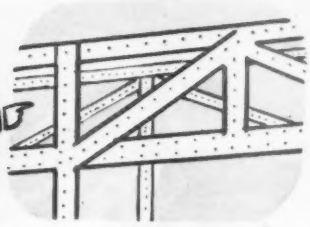

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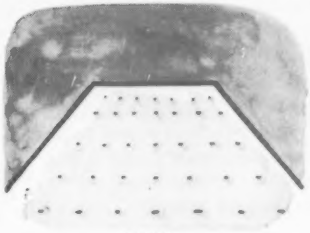

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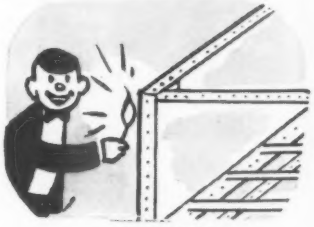

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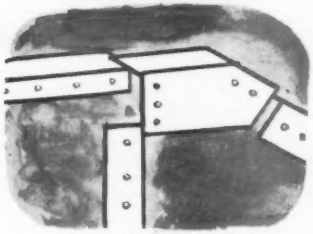

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Ring-Balance Flow Meter uses American ¼" SO Seamless Stainless Steel Flexible Metal Tubing to convey gases, such as hydrogen, oxygen, illuminating gas—at pressures up to 250 p.s.i. Meter shown here is Model 2656-R 80, manufactured by the Hagen Corporation, Pittsburgh, Pa.

Arrow points to American Oval UI Aluminum Flexible Hose as used for the coin rejector chute on coin-operated phonographs made by the Rock-Ola Manufacturing Co., Chicago, Ill. Construction of this hose is shown at left.

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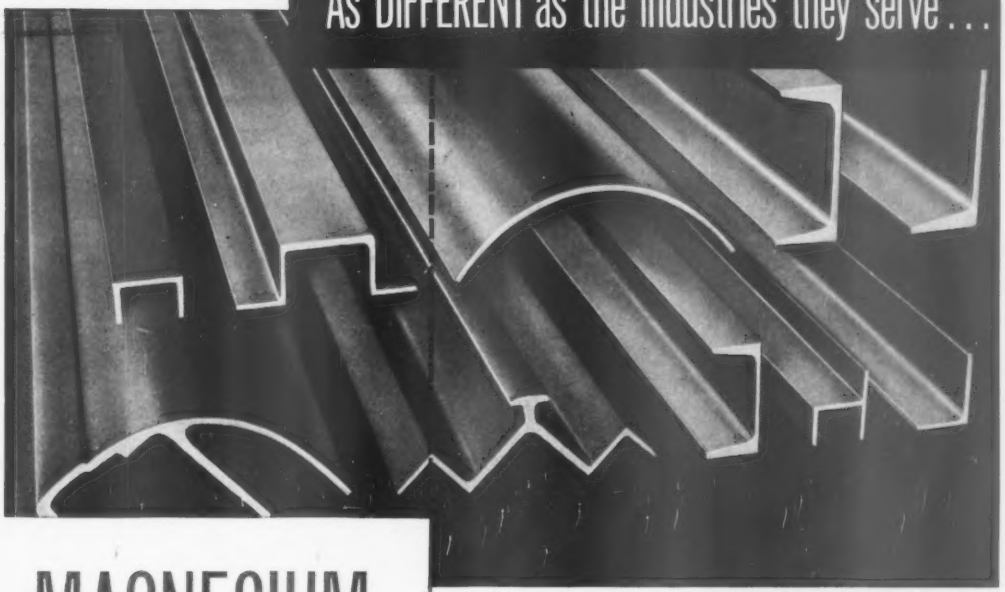

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Think of what that means in terms of engineering and manufacturing your product. It gives your designers maximum freedom and it simplifies shop procedure. The fact that magnesium can be extruded into many intricate shapes often eliminates forming or fabricating from standard shapes and sheet.

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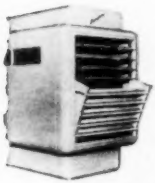
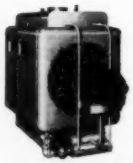


View at left shows unit heater with louvers adjusted to direct the heated air downward.



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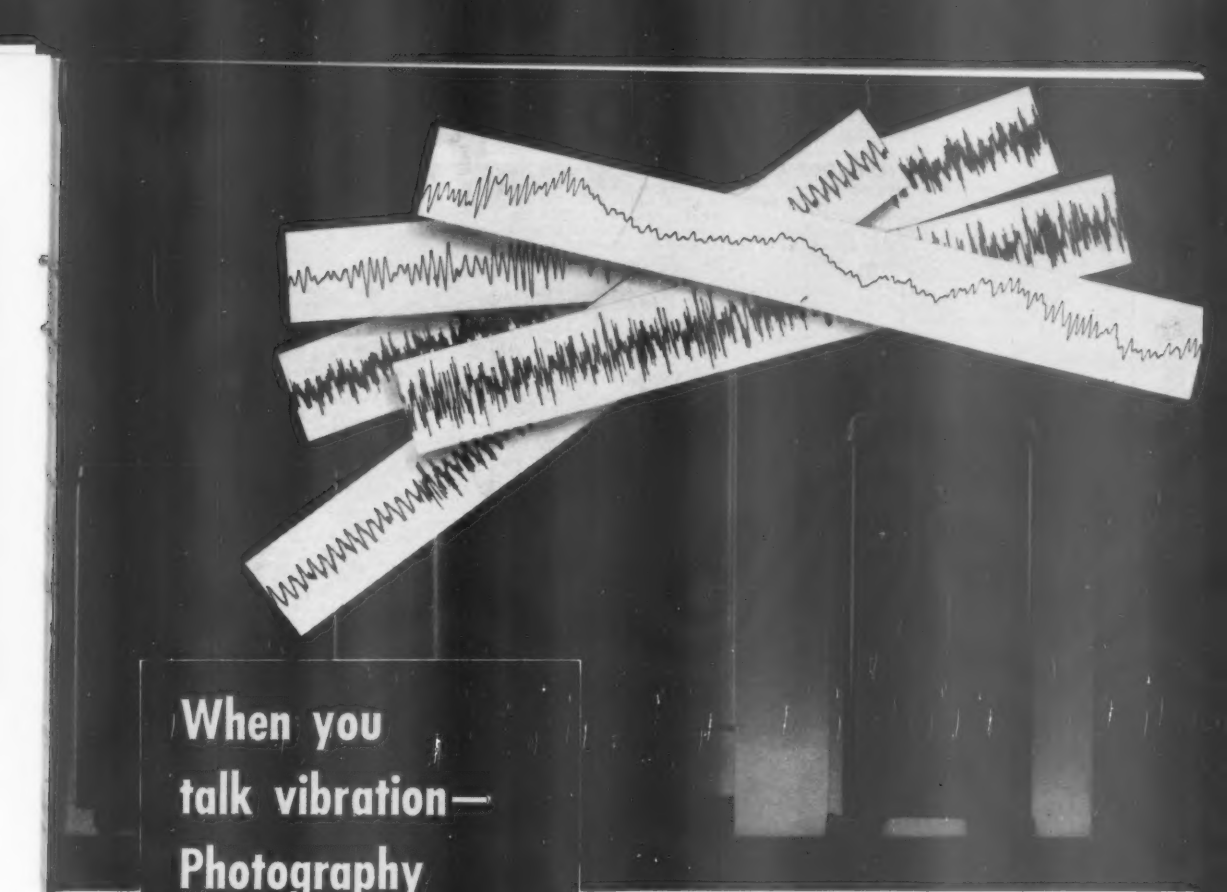

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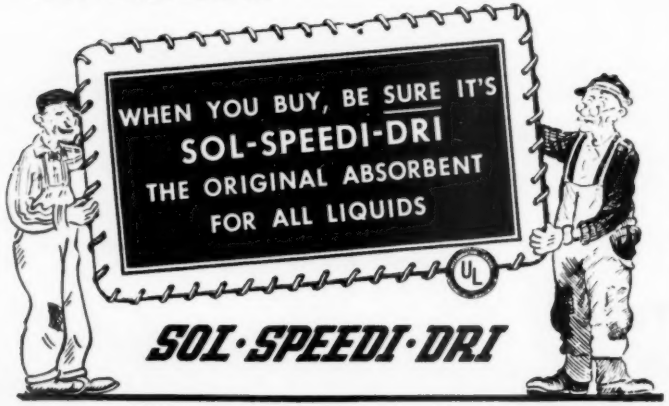

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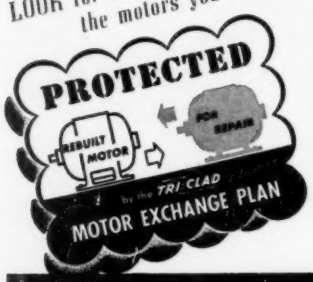

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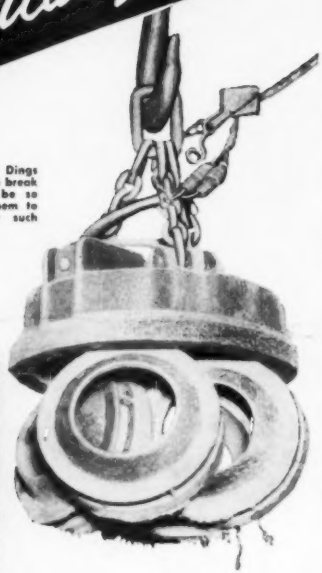

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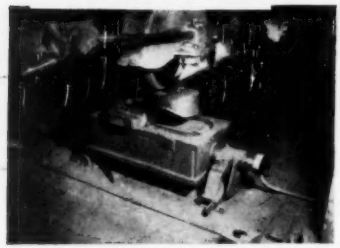

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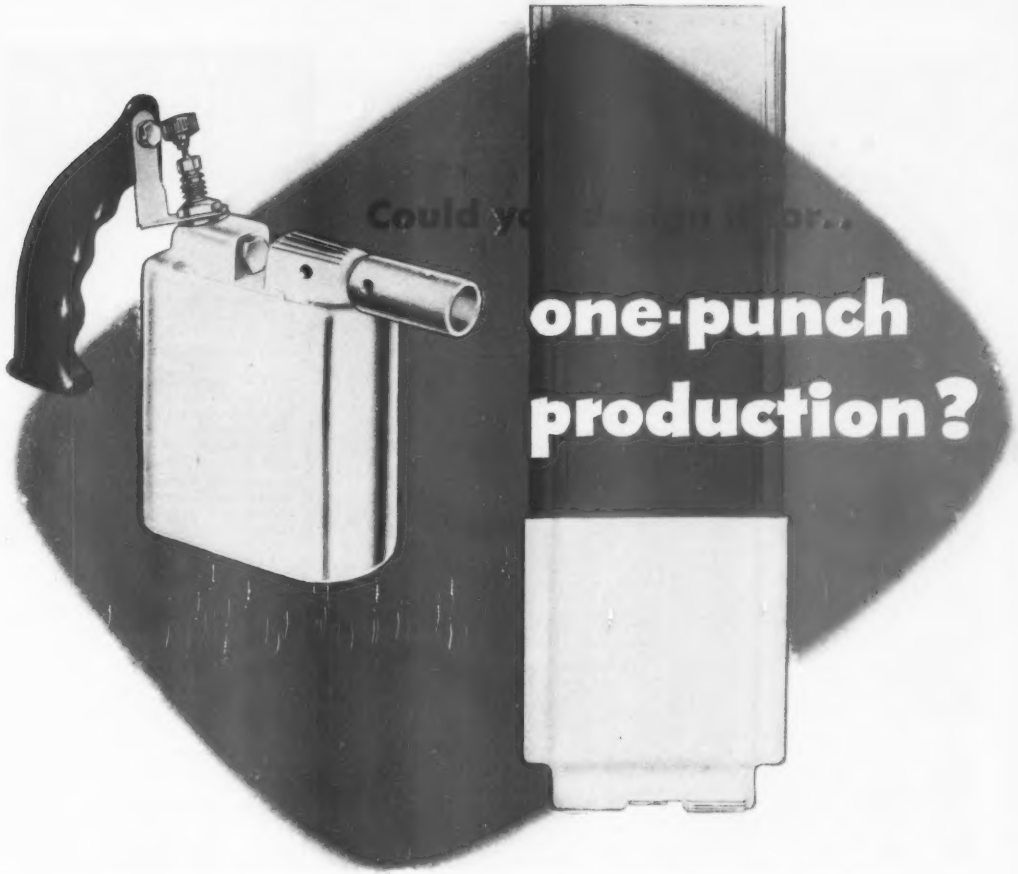

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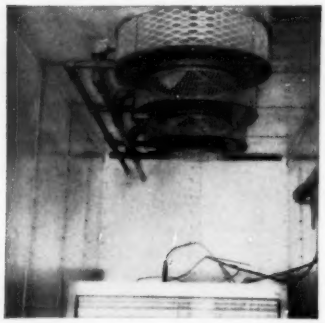

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ICE MACHINE — Tube-Ice process, operation of machine; applications. Photographs, description of freezing, thawing cycles; layout charts. Henry Vogt Machine Co.

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INSULATION—New purchasing specification sheet on mineral wool blanket, felt, industrial batt insulation. Federal Specification HH-I-563. Industrial Mineral Wool Institute.

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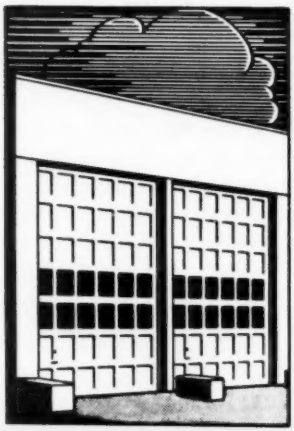

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—84—
PHOTOGRAPHIC EQUIPMENT—Four models of Kodagraph Micro-file machines, with reader, enlarger, projector: Micro-File Film Unit. Description, illustration, uses of each. 12 pp. Eastman Kodak Co., Industrial Photographic Div.

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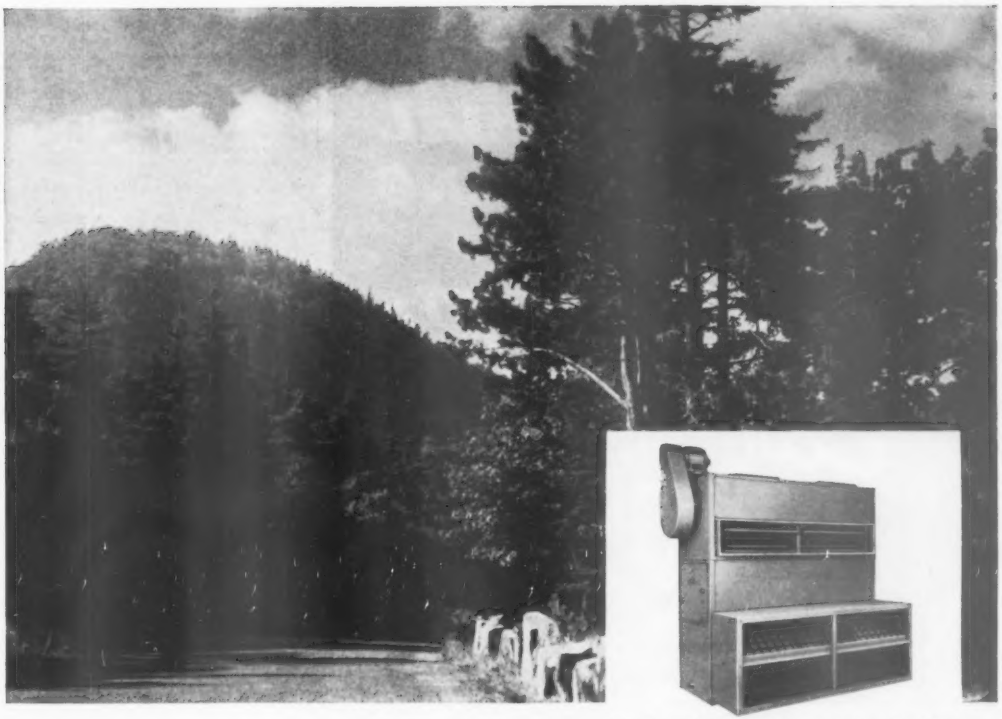

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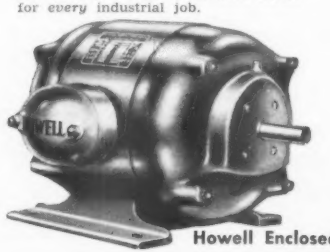

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SNUBBERS—**108(a)** Bulletin on snubber called Slug Buster SDG, for reducing noise from engine exhausts, vacuum pump discharges. Features, applications; photographs, charts. **108(b)** "Bouncing Pipes," engineering bulletin; fundamental concepts of oscillating flow of gas in pipe lines; sketches, charts. Burgess-Manning Co.

—109—

SPEED REDUCERS — motorized and motorless; for low-speed power. **109(a)** Construction of gear-motors, gearboxes; photographs, dimensional diagrams, specifications, capacities of different types. **109(b)** Bul. 10-10, 22 different sizes of speed transmission equipment, with photographs, descriptions. Janette Mfg. Co.

—110—

STARTERS, A.C. MAGNETIC—reversing across-the-line type; Bul. 4310, with overload relays; Bul. 4350, without overload relays. Description, features, application, construction. Schematic diagram for 3-phase type. Ward Leonard Electric Co.

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—118—

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—119—

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—120—

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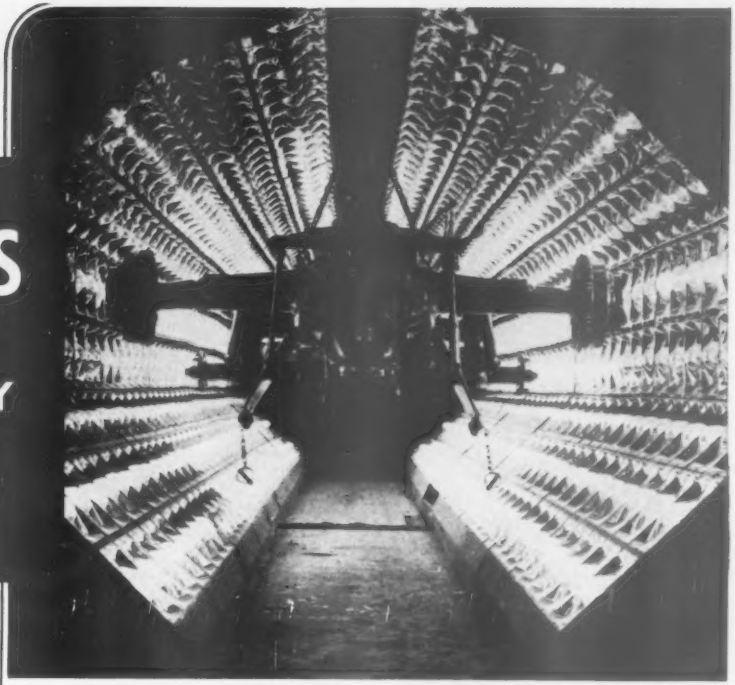

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—132—

WATER CONDITIONER—called Bru-Cex, for systems using up to 1,000,000 gallons per month. Photographs of installations, sketches, Bruner Corp.

—133—

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—135—

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—138—

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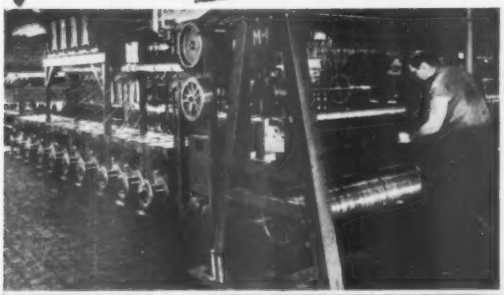
New Plant TO MEET DEMAND

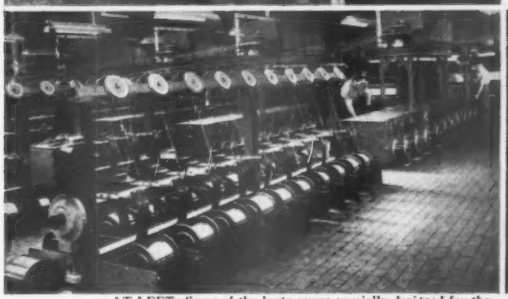
ROEBLING ROEVAR MAGNET WIRE



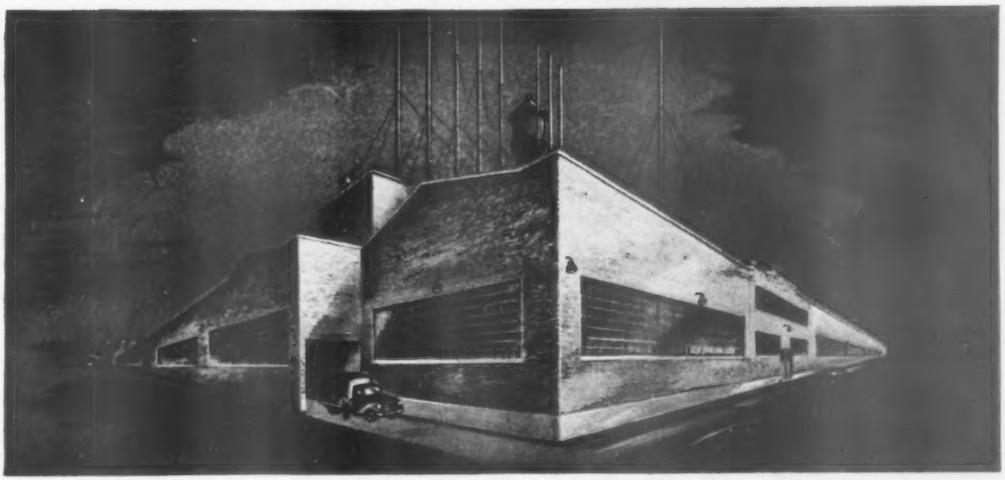
NOW IT'S IN FULL SWING . . . the most modern, precision-equipped magnet wire plant in the world. And it's fair to say that *customers* built this new plant. It *had* to be built to meet the increased demand for Roebling Magnet Wire.

Roebling Roevar Magnet Wire is your best choice for high-speed winding . . . its insulation is 10 to 40 times tougher than conventional enamel. Roebling Roevar also has a better space factor and costs less. But whatever your special requirements, Roebling can meet them with cotton, Roeglas, paper and other insulations of topmost quality.

Write for full data and samples. John A. Roebling's Sons Company, Trenton 2, New Jersey.



AT LEFT: Some of the large ovens specially designed for the production of Roebling Roevar and Roebling enamel magnet wires. Composed of a pre-annealer, enamelling oven, and individual take-up equipment, they are electrically equipped and controlled to insure highest, uniform quality. RIGHT: A group of seven small enamelling ovens located in a special department for producing Roebling Roevar and Roebling Enamel Magnet Wire in the finer sizes.



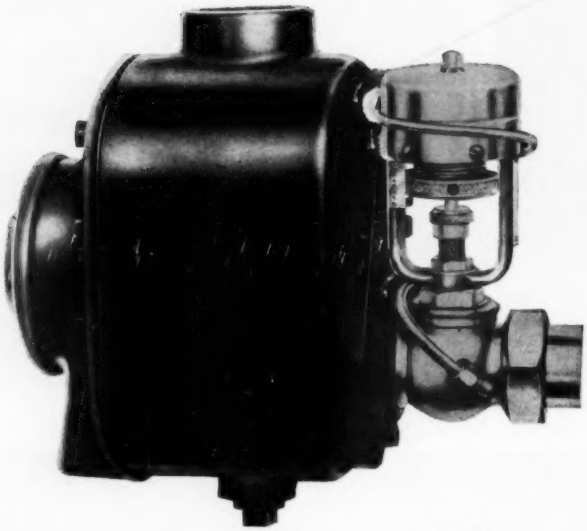
FOR OTHER ROEBLING ELECTRICAL WIRE AND CABLE
WRITE NEAREST ROEBLING OFFICE FOR NAME OF YOUR DISTRIBUTOR

Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave. So.

ROEBLING

A CENTURY OF CONFIDENCE

It masterminds hot water supply ...with a *Money-Saving Eye!*



Fulton Sylphon Hot-Cold Water Mixer No. 902. Operates with hot water pressure anywhere between 5 lbs. and 125 lbs. per square inch, and the cold water pressure anywhere between 2 lbs. and 125 lbs. per square inch.

"Everything's under control"

This Sylphon Hot-Cold Water Mixer supplies constant temperature water for industrial processes, shower baths, lavatories, etc., and does it economically. For it is self-contained, self-powered, fully automatic.

It has an adjustable temperature range—can be set to give you the temperature you want, and *keeps* it there. It assures dependable hot water supply . . . helps save fuel cost . . . helps maintain economical production efficiency.

What's more, if either hot or cold water supply fail, this Mixer automatically shuts off the remaining supply. When supply is returned, the Mixer automatically starts functioning again.

Sylphon Water Mixer No. 902 is used in apartments, hotels, hospitals, schools, factories, etc. It's rugged, long-lasting, dependable. Send for complete information. Ask for Catalog LF-A.

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Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
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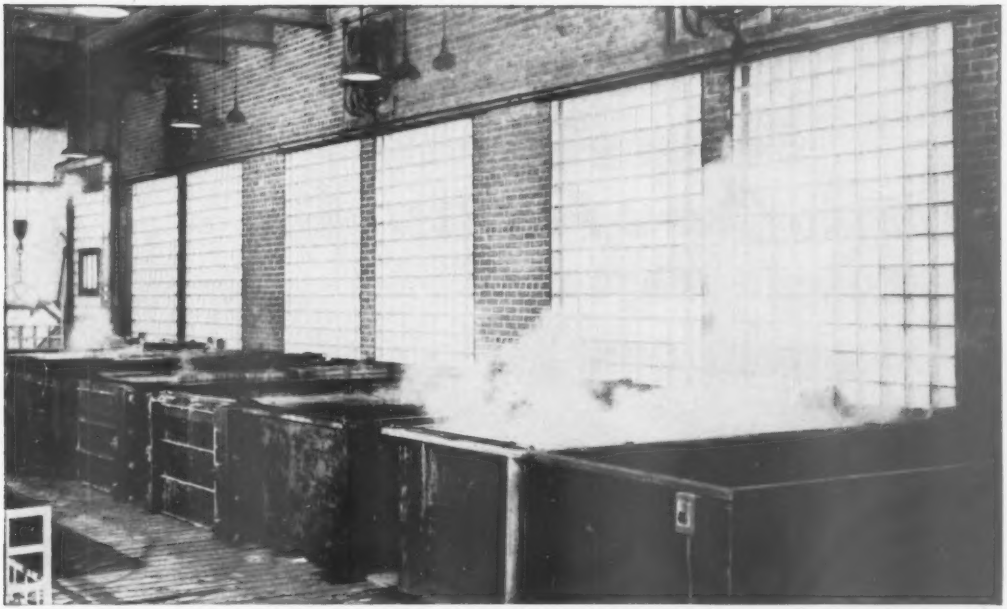
ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal



Insulux Panels reduce maintenance due to corrosive atmosphere in pickling room, Wolverine Porcelain Enameling Company, Detroit, Mich.

Reduce maintenance costs with Insulux

HERE'S AN entirely different building material that does things other materials will not do—Insulux Glass Block.

Insulux freely transmits daylight to plant interiors, reduces maintenance costs, increases plant efficiency. The advantages are many—it pays to modernize with Insulux!

Consider these reasons

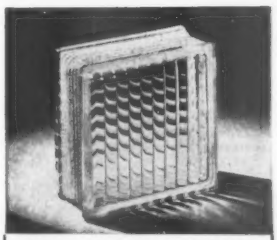
Modernization with Insulux is a program well worth your consideration:

1. **Insulux reduces maintenance costs—does not need painting, is easy to keep clean, and does not rot, rust or corrode.**
2. **Insulux Glass Block has high insulation value—this means more uniform temperature control, less condensation during cold weather, lower fuel bills.**
3. **Insulux transmits and distributes daylight to plant interiors.**
4. **Insulux reduces infiltration to a minimum, helps keep plant air dust-free and eases the job of humidity control.**

Every Insulux Glass Block is a sealed hollow unit, made of water-clear pressed glass. This unique construction offers a remarkable combination of advantages, either for new construction or replacement of existing windows.

Get the facts

See for yourself why Insulux Glass Block is the perfect form of daylighting for factories. Consult your local Insulux dealer, or send coupon below for free booklet. It gives complete information on many successful Insulux applications and is illustrated with hundreds of pictures.



INSULUX

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AMERICAN STRUCTURAL PRODUCTS COMPANY

Subsidiary of
OWENS-ILLINOIS GLASS COMPANY

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Please send me your free 36-page, fully illustrated booklet, "Daylight in Industrial Buildings."

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of these

Lorain Crane Features

to LOWER MATERIAL HANDLING COSTS

Are you faced with today's high "break even point" and the need for cutting material handling costs? The many job-tested features found in Lorain Self-Propelled Cranes, make material handling jobs around a modern plant or storage yard an easy, low-cost operation. With this single-engine, *one man* machine, you can cover stockpiles in every nook and cranny of your yard . . . obtain additional storage from limited space . . . serve several nearby yards . . . with a minimum of man-hours and manpower.

There are three basic types of Lorain Cranes—two-speed crawlers; rubber-tire mounted Self-Propelled cranes for localized mobility (speeds up to 7 M.P.H.); and rubber-tire Moto-Cranes for fast travel between plants or stockyards at speeds up to 30 M.P.H.

Call your local Thew-Lorain Distributor for full details.

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PUT THESE LORAIN JOB-TESTED FEATURES TO WORK FOR YOU

1. 15 different attachments to handle various materials
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6. 4 speeds in both directions (up to 7 M.P.H.) on rubber-tires
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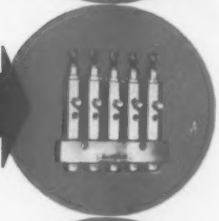
Standardize Lubrication Practices

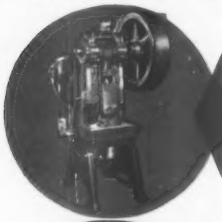
APPLY THE RIGHT LUBRICANT

IN THE RIGHT QUANTITY

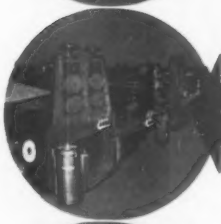


AT THE RIGHT TIME

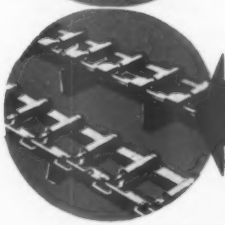
Convert obsolete methods to Centralized Lubrication Circuits



MANUALLY OPERATED



INDIVIDUALLY POWER DRIVEN



COMPLETE MASS LUBRICATION

with LINCOLN *Standardized* Lubricating Systems

D40-15

Install Lincoln Standardized Lubricating Systems

Call your Lincoln Distributor or the Sales and Service office nearest you for expert advice on standardizing your lubrication practices. Ask for copies of Bulletins on Centro-Matic Systems and Industrial Catalog No. 63.

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MORSE-ROCKFORD

OVER-CENTER

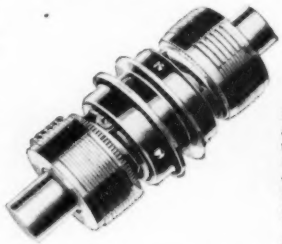
FRICTION CLUTCH

FOR A REAL package of power transmission, here's a small-diameter clutch that offers dependable, powerful, trouble-free operation! It's the Morse-Rockford toggle-type over-center Clutch. The same over-center principle used in high torque, heavy duty tractor and hoisting clutches is found in this compact clutch design.

The Morse-Rockford Clutch's strong, symmetrical body and release sleeve are accurately machined to provide top performance and efficiency. Its operating links, pins, and collars are of hardened steel. The release bearing (shifter collar) is made of the highest quality bronze for long wear and high strength.

The toggle action of the Morse-Rockford Clutch goes "over-center," locking the clutch in driving position, and provides smooth, easy engagement for powerful pull. The toggles are factory-assembled with the release mechanism and adjusting plate as a unit, assuring easy assembly and disassembly. Adjustment is accomplished by loosening a conveniently located Locking Screw and turning the threaded, forged-steel Adjusting Plate by hand.

Four clutch models, each in three sizes, afford a great variety of arrangements with different driving cups. Morse engineers will make special application recommendations upon receipt of complete information. Catalog SDOC available on request. Write Dept. 361, the Morse Chain Company, Detroit 8, Michigan.



If design space limitations are your problem, check the Morse-Rockford Pullmore Clutch, a multiple-disc clutch transmitting heavy loads in comparison to the clutch diameter. Write for the Morse Pullmore Clutch catalog.

Morflex Couplings

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MECHANICAL *POWER TRANSMISSION* PRODUCTS

A PRODUCT OF BW BORG-WARNER

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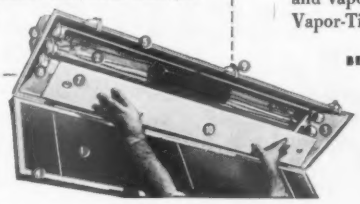
FOR *Modern* LIGHTING

of locations with Adverse Atmospheric Conditions

Specify "SEALED-FLO *40*"

THESE 10 BENJAMIN FEATURES ASSURE BETTER LIGHTING OF DUSTY OR MOIST LOCATIONS

1. A Double-Strength Grade "A" **Clear Glass Cover** also available with heat and impact-resisting glass.
2. **High Light Output**—Twin-Lamp Units have an efficiency of 67% or more of the output of the lamps; Triple-Lamp Units 61% or more.
3. **Porcelain Enamel** on all inner reflecting surfaces, combining a high reflection factor of 82% with a high diffusion factor.
4. **Dust-and-Vapor-Tight Seal** formed by wire reinforced woven asbestos gasket.
5. **"Sealed Bead" Construction**, which resists rust and corrosion.
6. **One-Piece Steel Construction**, completely covered with easy-to-clean **Porcelain Enamel**.
7. Self-adjusting, hand-operated **"Lok-Latch" Fasteners**, which permit easy removal of the reflector plate.
8. Exclusive, unbreakable **"Spring-Lex" Lampholders**, which facilitate relamping and lock lamps into position.
9. **Three Spring Tension Clamps**, which allow easy opening of the cover.
10. **Removable Reflector Plate**, which makes possible easy access to control equipment and wiring.



"Sealed-Flo 40" Fluorescent Lighting Units are designed to solve the problem of how to provide modern lighting in locations where conventional-type fluorescent units do not meet with Underwriters' Laboratories approval. To these many locations in industry where atmospheric conditions are adverse or hazardous, "Sealed-Flo 40" Twin-Lamp and Triple-Lamp Units bring the full benefits of modern fluorescent lighting.

Under such severe operating conditions "Sealed-Flo 40" Units function at peak efficiency and at minimum operating and maintenance cost. Important to such performance is the "One-Piece" construction with an over-all protective coating of durable, easily cleaned Benjamin "Life-Time" Porcelain Enamel.

"Sealed-Flo 40" Units satisfy all requirements of Underwriters' Laboratories for installation in Classes II, III, and IV hazardous locations. Such locations may be found in flour and feed mills, grain elevators, coal chutes, cotton gins, wood-working plants, warehouses storing baled waste, cocoa fibre, Spanish moss, etc., as well as all departments where combustible dusts may create fire or explosion hazards and where maintenance due to dirt and vapor is a problem. "Sealed-Flo 40" Units are also rated as Vapor-Tight by Underwriters' Laboratories.

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BENJAMIN

Lighting Equipment

Distributed Exclusively Through Electrical Wholesalers

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flexible metal hose!

Three photos can show only the beginning of uses for CMH Rex-Tube Flexible Metal Hose. And there's a good reason for this wide range utility... Standard Rex-Tube is made in nine basic types in galvanized and stainless steel, brass, aluminum, and other alloys... in sizes from 5/32" to 12" inside diameters!

Each Rex-Tube type has been developed to handle certain applications best. CMH leadership in the science of FLEXONICS provides the knowledge necessary to make Rex-Tube dependable and long-lasting in service where temperature, pressure, vibration or corrosion conditions are usually severe.

Write for data sheets and specifications on CMH Rex-Tube Flexible Metal Hose for your service.

CMH—ONE dependable source
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• CMH manufactures all standard types of flexible metal hose, both convoluted and corrugated, in a variety of metals; expansion joints for piping systems; stainless steel and brass bellows; various conduits and special assemblies of these components.

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Leaders in the Science of Flexonics
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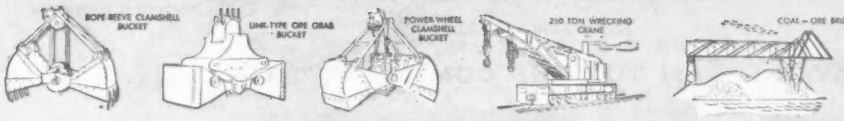
FLEXON . . . . . identifies CMH products which have served industry for more than 47 years.

INDUSTRIAL BROWNHOIST AT NATIONAL TUBE

Here is an Industrial Brownhoist Diesel Locomotive Crane doing one of the many heavy jobs it performs daily for the Lorain, Ohio, plant of the National Tube Company, a subsidiary of the United States Steel Corporation. . . Men who know cranes can always spot an Industrial Brownhoist by its exclusive, patented Monitor-type cab. The operator is centrally located in relation to the load and is stationed above and behind the machinery. It provides the operator with 360° visibility — front, rear and both sides — plus a full view of hoist and boom drums, machinery and load at all times. Two doors, one on each side of the cab, contribute to greater safety and with the windows afford maximum ventilation. The result is easier, faster, safer materials handling. Write today for illustrated literature giving complete facts.

A Model 5 Brownhoist Diesel Locomotive Crane unloading "pig" in the Lorain, Ohio, yards of National Tube Co.

BROWNHOIST BUILDS BETTER CRANES



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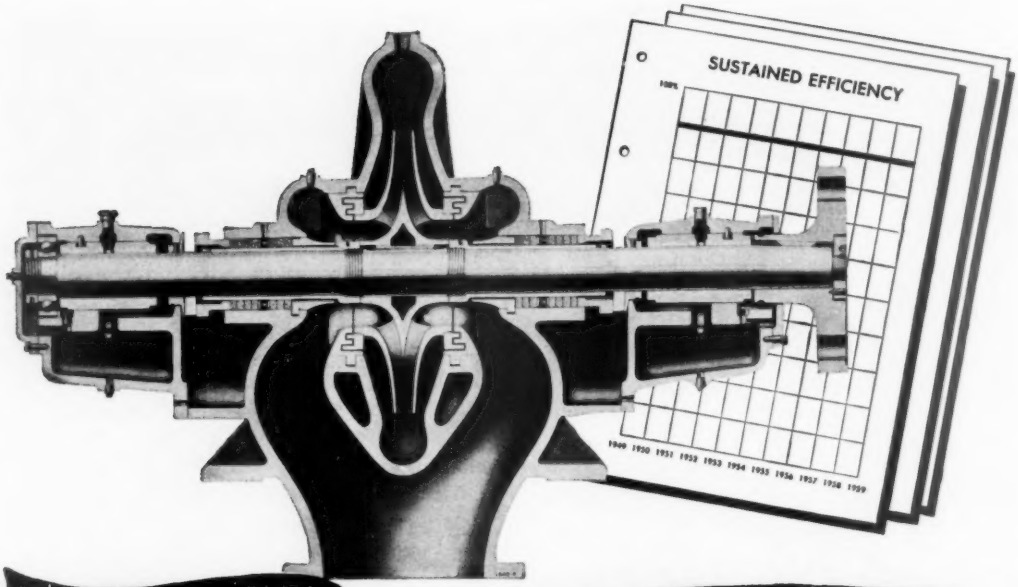

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LABYRINTH RINGS

KEEP PUMP EFFICIENCY HIGH!

Here's why: Look at the diagrams at the right and you can see how the leakage from discharge to suction at the running joint is kept to an absolute minimum by the flow retarding action of the labyrinth passages.

Unlike a flat ring, the De Laval large clearance labyrinth ring does not depend upon close clearances, subject to wear and enlargement. The flow retarding action of the labyrinth keeps efficiency high for the life of the pump and you benefit by low power costs and low maintenance year after year.

When you buy a centrifugal pump, *specify De Laval*...it pays in the long run.

SEND FOR CATALOG 10-13-J

De Laval large clearance labyrinth wearing ring. Note flow retarding action of tortuous passage.

Ordinary flat wearing ring. Note that flow retarding action depends upon close clearances.

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Thor presents the smallest GEM in the Silver Line*

smaller... lighter... more powerful than any other ¼" DRILL in the field!

Thor is now shipping from the assembly lines of its great new *Silver Line* this lightest, smallest, most powerful and highest quality 1/4" standard duty portable electric drill ever built!

It weighs only three pounds, is only 7-7/16 inches in length—yet in this small handful packs power unmatched by any tool in its class . . . plus all the features of Thor's amazing *Silver Line*—die cast housings, all ball bearing, Heli-Coil thread inserts, etc. Available in seven drilling speeds, from 550 to 5000 R.P.M. Write today for *Silver Line* Catalog E-2, or see your Thor distributor.

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UNBRAKO DEFIES VIBRATION

Defying vibration is an important part of our business. Every day we help an increasing number of manufacturers successfully combat high maintenance costs resulting from the destructive effects of this "bogey-man" of Industry.

A small and ubiquitous SPS product does the trick. It is our famous UNBRAKO Self-Locking Set Screw with the Knurled Point—"the screw that won't shake loose." The exclusive counter-clockwise *knurls* on the point make the UNBRAKO exceptionally vibration-resistant, effectively preventing "creep" and subsequent loosening of the screw, even under conditions of the most chattering vibration. Millions in use prove this fact.

This remarkable ability of the UNBRAKO Self-Locking Screw to "stay put" can effect real savings in maintenance and down-time costs on all kinds of production machinery. And on UNBRAKO-equipped finished products "Vibration Insurance" can be an important selling point.

If vibration is costing you sleep and profits, this SPS product may be able to help. Ask us for full information.

"UNBRAKO" *Knurled Socket* Head Cap Screw

"UNBRAKO" *Self-Locking* Hollow Set Screw

"FLEXLOC" *Self-Locking* Nut

"HALLOWELL" Steel Shaft Collar

"HALLOWELL" Work Bench of Steel

SPS STANDARD PRESSED STEEL CO.

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"Serving Industry continuously since 1903 through Industrial Distributors"

What does it Cost to keep a ROOF over Your Head?

Monel caps, gutters and siding on skylight were installed on this coal-burning power plant in 1913. These, along with other Monel roofing parts, have needed no repairs to date.

You don't have to go on replacing leaky roofs and roofing parts. Using economical Monel Roofing Sheet, you can now install life-of-the-building roofing at a surprisingly low cost.

Are roofing repairs a constant expense for you?

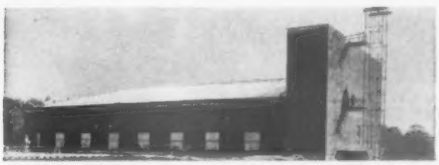
They *wouldn't* be . . . if your roof and roofing parts were made of Monel*.

For *Monel* roofing is "life-of-the-building" roofing. Just look at the properties of this ⅔ nickel-⅓ copper alloy. It can never rust. It resists severe stresses . . . wear . . . corrosion by industrial fumes, smoke, salt air and water. It withstands extreme temperatures without buckling or cracking.

As a roofing material, it has proved its merit repeatedly. Monel roofing installations date as far back as 1910 . . . *and they are still in good condition.*

And best of all, you can install Monel roofing at reasonable cost. The greater strength of Monel permits use of thinner gauges; the easy workability (cutting, forming, soldering) keeps costs down.

Investigate Monel the next time you repair your roof. In addition to entire roofs, you can get Monel protection for *any part* of your roof . . . drainage systems . . . flashings . . . skylight frames . . . ventilators . . . louvers . . . siding . . . expansion joints . . . copings.



Ford Motor Company chooses Monel Roofing Sheet for this building in its Engine Research Center. Batten seam roof, louvers, drip strips and flashings are of long-lasting Monel.

MONEL ROOFING

For the "Life-of-the-Building"

Send for booklet, "ONE METAL ROOF"

It shows typical installations, tells about Monel's many advantages, cites long-service records. Included is a "test-it-yourself" sample of Monel Roofing Sheet.

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Please send me a copy of "ONE METAL ROOF" and the sample of Monel Roofing Sheet.

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City.....State.....

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THE INTERNATIONAL NICKEL COMPANY, INC.

*Reg. U. S. Pat. Off.

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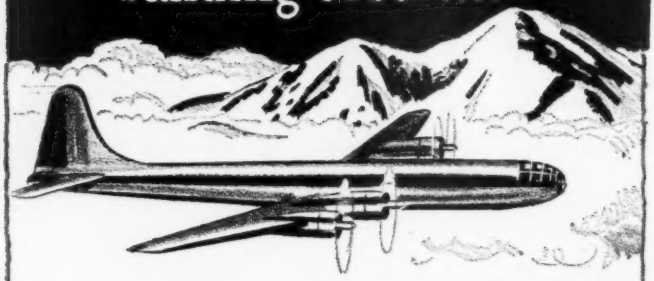
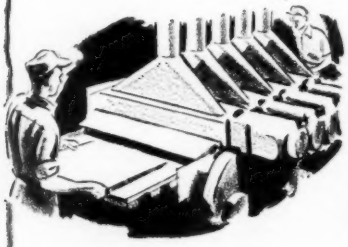
Up in the air over sanding costs?...



...try JEWEL ABRASIVES

THE SLEEK STAINLESS STEEL "SKIN" USED IN LARGE QUANTITIES FOR AIRCRAFT IS FINISHED AT LESS COST WITH SPECIALLY DESIGNED JEWEL SILICON CARBIDE PAPER BELTS. HEAT-RESISTANT, THEY CUT FASTER, LAST LONGER. ASK YOUR DISTRIBUTOR. OR WRITE US.

ALUMINUM ALLOY CASTINGS ARE FINISHED MORE EFFICIENTLY IN A MAJOR AIRCRAFT PLANT WITH JEWEL SILVER STREAK BELTS. LIKE ALL JEWEL BELTS, SILVER STREAKS HAVE AP'S EXCLUSIVE VELVET JOINT THAT WILL NOT BUMP OR JUMP UNDER THE WORK.



UP TO 800% INCREASED DRUM SANDER PRODUCTION IS NOW POSSIBLE IN WOODWORKING WITH AMAZING BONDEX GARNET FIBRE. THIS OUTSTANDING ABRASIVE IS ONLY ONE OF THE MANY NEW DEVELOPMENTS PIONEERED BY AP ENGINEERS.

ORDER JEWEL COATED ABRASIVES FROM YOUR DISTRIBUTOR. OR, IF YOU HAVE A SPECIAL PROBLEM, WRITE US A LETTER.

Abrasive Products, Inc.

SOUTH BRAINTREE 85, MASSACHUSETTS — MAKERS OF JEWEL COATED ABRASIVES

HANDEEZ

REMOVES SHOP GRIME *SAFELY!*

Don't confuse HANDEEZ with ordinary harsh abrasive-action hand cleaning compounds. HANDEEZ works differently — through a gentle emulsifier blended with a sterilized vegetable emollient. It lifts grime from the pores, leaving skin tissue unharmed and unbroken by tiny crevices which invite infection. Cutting oils and other deep-seated shop grime yield readily to the HANDEEZ formula which spells prompt, efficient cleansing with the added skin-safety factor.

Write for the booklet "Be Kind to these Hands."

The C. B. DOLGE CO.
WESTPORT, CONNECTICUT

Pittsburgh *Chain-Link* Fence

For complete protection of your property and equipment consult our chain-link fence experts. They will plan an economical installation and give you a free cost estimate. Write today!

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GRANT BUILDING, PITTSBURGH 30, PA.

NOW...

AMERICAN REDUCTION DRIVES *available for your* VERTICAL APPLICATIONS!

Its SIMPLIFIED DESIGN prices it 30% to 50% BELOW other Vertical Speed Reducers!

All the advantages of American Reduction Drives now incorporated in this new Vertical Speed Reducer!

- Any driven speed below 154 r.p.m. from standard, stock parts!
- 75% LESS headroom required . . . the Speed Reduction Unit mounts right on the shaft of the driven machine!
- No special supports or brackets!
- Primary belt drive cushions damaging impact of starting and shock loads!
- Quick, easy speed changes!
- 1/3 LIGHTER than other vertical reducers!
- Interchangeable bushings permit easy installation and relocation!

For complete information on the design, construction, specifications, and selection of the unique American Reduction Drive for vertical applications, drop us a line, now.

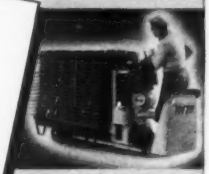
The American Pulley Company

4210 WISSAHICKON AVE. • PHILA. 29, PA.

F.O.B.

with **truck-man** *means*

FASTER ON BOARD



It's *easier,* too, with this Truck-Man Pallet Toter. Note this 180° turn into a standard seven foot car door with a heavy, bulky load . . . and plenty of room to spare! That's typical Truck-Man maneuverability, designed into all three Truck-Man models to cut your handling costs.

The Model DF Pallet Toter handles pallet loads faster and better because it's *designed* for horizontal pallet movement. Forks of heavy channel steel operate hydraulically, auto primed, with complete control from the driver platform. Weight empty, 920 pounds . . . load rating, 3500 pounds! Brake and clutch work from the same lever. Turns 360° in its own length! Rugged, six inch wide load wheels have rubber inserts for easy riding and quiet operation; dual drive wheels are pneumatic for better traction and easy riding . . . both are "friendly to floors".

All three Truck-Man models powered by the Wisconsin Heavy Duty air-cooled gasoline engine. *All three* give you . . .

- Round-the-clock operation . . . no layups for battery charge . . . no battery charge equipment to buy.
- Economy . . . eight hours work on one gallon of gas.
- U/L approval . . . simplicity—safety—stamina!

"and the operator rides with the load!"

TOP: Model D Skid Lift, over 1½ Ton Rating.
BOTTOM: Model DT, the handy Platform Utility for all 'round plant use.

$850
F.O.B. JACKSON

•

Ask Any Operator or the **truck-man** *Distributor in Your Area*

UL

truck-man INC., 1405 W. Ganson, Jackson, Mich.

Send me information on the Truck-Man models checked below:

☐ Hydraulic Skid Lift ☐ Pallet Toter ☐ Platform Utility

Name ..... Title .....

Company ..... Street No. .....

City ..... Zone ..... State .....

PROFITS *"ride the beam"*

Meet the upswing in material and labor costs through greater efficiency in production and cost control. Productimeter Electric Counters, actuated by a photo electric cell, present production figures that create "magic" profits.

Send for Catalog No. 55

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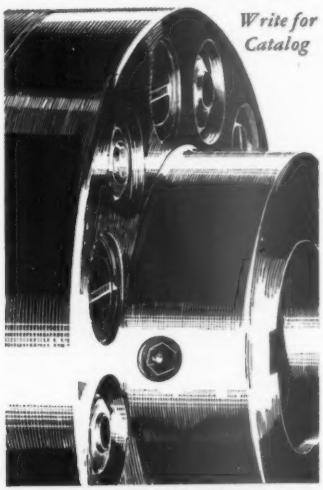
PRODUCTIMETERS
SINCE 1879
Speedometers OF INDUSTRY

AJAX **FLEXIBLE COUPLINGS**

Standard Equipment on America's finest Direct-Connected Machines

Write for Catalog



AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, NEW YORK

More OEM's* Specify US Gauge Than Any Other Make!

* Original Equipment Manufacturers

. . . Because USG Assures More Value

Throughout industry, the story is the same from year to year. Original equipment manufacturers (OEM's) demand substantial gauge value . . . accuracy, durability, and quality at economy prices . . . and 6 out of 10 specify US Gauges.

They know that US Instruments give more service, more accuracy, more *value* for the money. They know USG can supply all their needs—from highly specialized instruments measuring as low as 1" of mercury absolute, to standard type gauges measuring from 30" vacuum to 100,000 pounds pressure per square inch. And they know that for more than 40 years US Gauges have been the standard of dependability. So more original equipment manufacturers specify US Gauges than any other make.

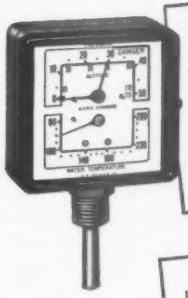
Next time you order gauges, follow the lead of these satisfied users . . . buy US Gauges. For more information about US Gauge write today. United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Penna.

US GAUGES—BETTER INSIDE...BETTER OUTSIDE...BETTER ON YOUR PRODUCT

UNITED STATES GAUGE

TURRET CASE GAUGES

A complete line of bakelite turret case gauges conforming to current U. S. Navy specifications. For general use in refinery, chemical or power plants. Bourdon tube of phosphor bronze or stainless steel conforming to Navy types A or B. Movement of corrosion resistant bronze and nickel silver construction. Socket, spring, movement and dial are an integral unit removable from case for testing. Micrometer adjustable pointer, separate adjustable red hand. Accuracy ½ of 1% for middle third of scale and 1½% maximum scale range of balance. Ranges up to 5000 P.S.I.



COMBINATION THERMOMETER AND ALTITUDE GAUGES

For installation on domestic hot water heating systems. Indicates on one dial: water temperature, altitude of water above gauge. Wide phosphor bronze Bourdon tube. All brass heavy-duty movement. Temperature indicating section of spiral bimetal strip connected to stainless steel shaft operating in phosphor bronze bearing. Heavy pressed steel case with low or back male connection. Ranges 60° to 260°F, 0 to 115 feet of water.

DUPLEX GAUGES

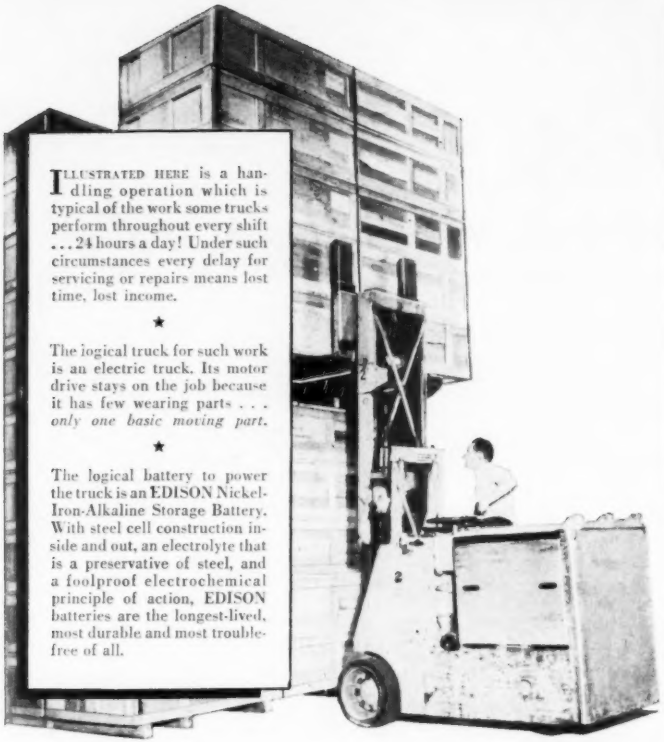
For use on equipment where it is desired to indicate two related pressures on one dial such as in: air brake systems, pneumatic receivers, differential pressure indicators, etc., with any media that will not attack brass or bronze. Two single phosphor bronze Bourdon tubes are independently mounted and connected to two separate threaded external socket connections. Specially constructed multiple plate quill type movement of brass throughout. Cast iron case, but available in a number of special case designs for close mounting. Lower or low back side-by-side connections. Accuracy 2% of scale range. Ranges up to 1000 P.S.I.

PRODUCTS OF UNITED STATES GAUGE... Absolute Pressure Gauges • Aircraft Instruments • Air Volume Controls • Altitude Gauges • Boiler Gauges • Chemical Gauges • Dial Thermometers • Glass Tube Thermometers • Flow Meters • Inspectors' Test Gauges • Laboratory Standard Test Gauges • Marine, Ship and Air-Brake Gauges • Recorders • Controls and Alarm Gauges • Voltmeters • Ammeters • Welding Gauges

U.S. INSTRUMENTS Tell The Truth

USG

How *continuously* it works is what counts



ILLUSTRATED HERE is a handling operation which is typical of the work some trucks perform throughout every shift . . . 24 hours a day! Under such circumstances every delay for servicing or repairs means lost time, lost income.

★

The logical truck for such work is an electric truck. Its motor drive stays on the job because it has few wearing parts . . . *only one basic moving part.*

★

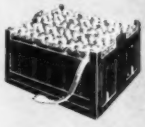
The logical battery to power the truck is an EDISON Nickel-Iron-Alkaline Storage Battery. With steel cell construction inside and out, an electrolyte that is a preservative of steel, and a foolproof electrochemical principle of action, EDISON batteries are the longest-lived, most durable and most trouble-free of all.

EDISON batteries give you many advantages: they're mechanically durable; electrically foolproof; quickly and easily charged; simple to maintain; not injured by standing idle. Get a current EDISON price quotation—you will probably find initial cost MUCH LOWER than you think. Couple this factor with well-known EDISON long life and you will have the key to year-after-year economy.

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES



EDISON STORAGE BATTERY DIVISION

of Thomas A. Edison, Incorporated, West Orange, N. J.

In Canada: International Equipment Co., Ltd., Montreal and Toronto

KLEIN

CUTS COSTS

with Correct CUTTING FLUIDS

MATHIAS KLEIN & SONS, Chicago, selected cutting fluids for machining high carbon vanadium steel forgings for the well known Klein pliers on a basis of competitive tests. When using D. A. Stuart's Solvol, tool life was more than double that secured by the best of several products tested.

With a 20 to 1 dilution of Solvol, side broaching is at the rate of 28,000 pieces per grind. Drilling, reaming and countersinking are done at the rate of 650 pieces per hour with a 30 to 1 dilution of Solvol.

The increase in tool life and production and the satisfactory finish secured with Solvol on this job are excellent examples of the cost cutting opportunities possible by using the best cutting fluid for the job. In buying cutting fluids it is *wise economy* to figure production costs rather than cutting fluid price. Write for booklet, *Cutting Fluids for Better Machining.*

STUART *service goes with every barrel*

D.A. Stuart Oil CO.

2735 South Troy Street, Chicago 23, Ill.

For wiping and polishing

Kimwipes*...
new industrial tissues

At last! A new, efficient cleaning material for a myriad of special wiping uses. Soft, fresh KIMWIPES* industrial wiping tissues. Easy to handle—quickly disposable. KIMWIPES remove the smallest shavings around machined parts without scratching. Recommended for use on all highly finished surfaces. So absorbent, they blot up 16 times their own weight in liquids.

With KIMWIPES, you can use a clean sheet for each operation. They're safer because when you throw away the used tissue, all grit and foreign matter are disposed of. Useful in machine shops, packing rooms—almost any type of business. For full details and the name of the KIMWIPES distributor nearest you, write us on your letterhead. Kimberly-Clark Corporation, Creped Wadding Division, Neenah, Wisconsin, U.S.A.

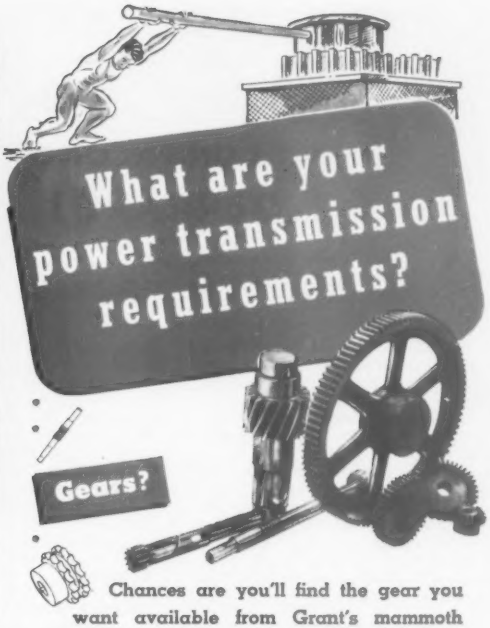
Automatic serve-up packages

Kimwipes*

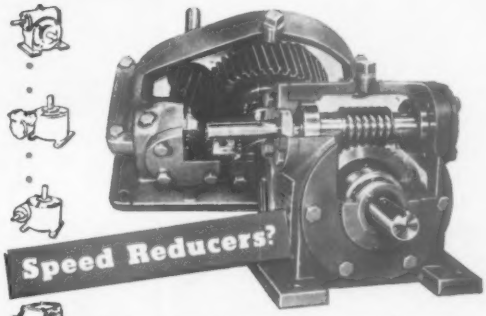
INDUSTRIAL WIPING TISSUES

*T. M. REG. U. S. AND CAN. PAT. OFF.

A PRODUCT OF Kimberly Clark



Chances are you'll find the gear you want available from Grant's mammoth stock. If not, complete facilities are available to cut all types. Deliveries made on your schedule. Write today for free catalog describing complete line.



Worm, double worm, compound worm and spur, helical, mitre gear — Grant makes them all . . . reductions up to 3660-1 . . . most types available from stock. Write for catalog describing each type in detail.

Special requirements? . . . unusual and difficult jobs are a Grant specialty . . . for an estimate write outlining your problem.

165 W. SECOND STREET
SO. BOSTON, MASS.

Grant GEAR WORKS INC.

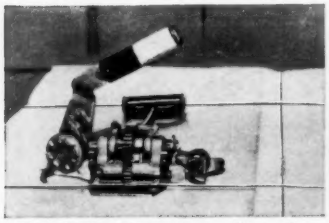
"The New Twist"
IN BUNDLING ECONOMY
...GERRARD!

The use of Gerrard Round Steel Strapping and Gerrard machines in your shipping room can save you money, time and worry. Here's why:

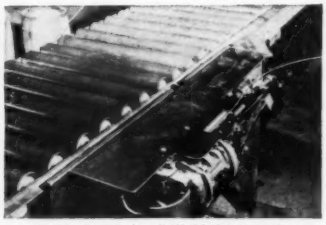
- Gerrard Strapping costs 30 to 50% less than any other metal reinforcement.
- It is easy to apply. Every Gerrard machine tensions the strapping, forms its own twisted seal, trimmed smooth with no exposed ends. Separate seals are not necessary.
- Gerrard Strapping keeps packages firm and rigid until straps are cut. Pilferage and claim losses are sharply reduced.
- Gerrard machines are serviced by the manufacturer, and replacements are made when necessary.
- There's a size for every need from parcel post packages to carload lots of machinery, and for all types of palletizing.

The services of Gerrard engineers are available *without charge to* help you solve packaging problems at your plant. Write for a free copy of *Blue Book of Packaging.*

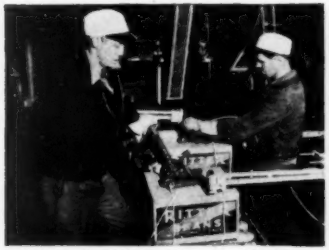
Gerrard Steel Strapping Company
2927 West 47th St., Chicago, Illinois



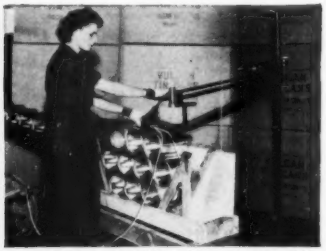
It's a simple matter to get taut, pilfer-proof bundles with Gerrard Round Steel Strapping. Between the small TA model and the semi-automatic Q model, there's a Gerrard machine to fit your needs. Shown is model LK for cartons, boxes, crates from 75 to 300 pounds.



Standard table for "Q" Model Semi-Automatic Machine is not used here. Head of Model "Q" is set into side of conveyor, saving handling time and speeding bundling procedure.



All Gerrard machines tension, tie and cut the strapping. This TI model on suspension equipment can be swung into desired position easily. Packages are firm and pilfer-proof, conveyor lines move rapidly.



Tin cans are quickly and securely tied with one Gerrard Steel Strap. TE machine on suspension arm can be swung aside when not in use.

GERRARD
ROUND STEEL STRAPPING
UNITED STATES STEEL

NEW TOOL
INTRODUCES NEW COST-CUTTING METHODS
PRECISE SUPER 40

45,000 R.P.M.
OVER 1/5 H.P.

Jobs requiring accuracy can now be turned out in production by using PRECISE SUPER 40 in standard lathe, drill press, etc.

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IDEAL FOR CARBIDE MICRO MILLS

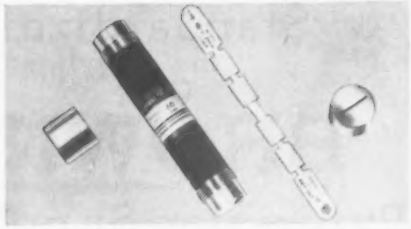
New all-metal housing . . . new, stronger precision quill . . . new sealed micro-precision bearings. Use with or without SUPER COOL-FLEX Attachment or as a Motorized Quill mounted in standard machine tools. Increased speed, power and precision cut working time—give a better finish on any material from wood to the hardest steel. Tools and attachments for any production set-up. 115 volt, AC-DC motor is protected by replaceable fusetron; sealed bearings never need lubrication.

Write FOR CIRCULAR

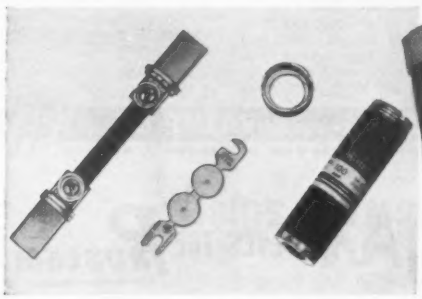
PRECISE PRODUCTS CO.
1354 Clark Street,
RACINE, WIS. U.S.A.

NOW TIME DELAY

that you can really depend on



New G-E ferrule-type fuse, now available in all commonly used sizes, is all new, all the way through. Only three parts to handle. Hinged door eliminates loose washers and small parts. You can renew them fast—you can count on them to do a dependable job.



New G-E knife-blade-type fuse, also available from your distributor in all commonly used sizes, is designed for easy renewal. Just loosen the screws—they can't fall out—and washers guide link into place. Washers are cup-shaped to protect the screw heads from splashed zinc and to prevent screwdriver from slipping.

ORDER G-E RENEWABLE FUSES

from the new wide range of sizes

Get the satisfaction of fuses you know you can depend on. There's no need to accept substitutes—order these all-new time-delay fuses from your distributor today.

Designed for extra reliability on the job, links used in these new fuses are the product of extensive General Electric research on normal time-delay requirements. Oversized lugs absorb the heat of momentary overloads. Sensitive connecting links blow fast when loads exceed normal peak. For fuses you can really depend on, stock up now on the new General Electric time-delay renewable fuses.

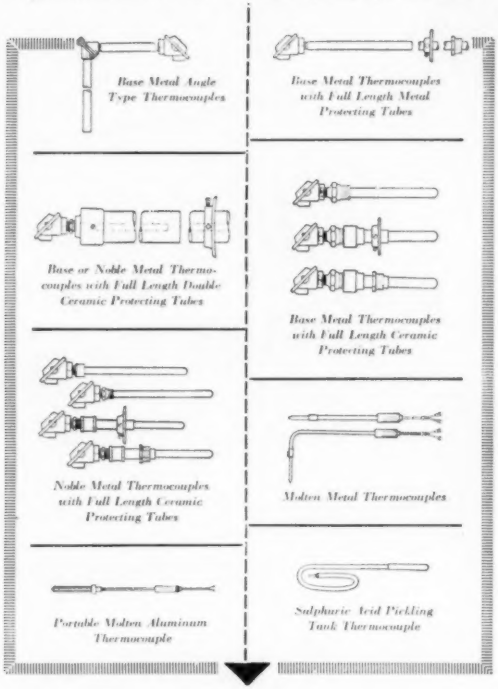
For more information on the new G-E fuse line, write to Section D34-634, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in

GENERAL ELECTRIC

Standardize on BROWN Pyrometer Supplies

It costs no more to use the best pyrometer supplies . . . the Brown name is your assurance of highest quality in materials, workmanship and specification.


Base Metal Angle Type Thermocouples
Base Metal Thermocouples with Full Length Metal Protecting Tubes
Base or Noble Metal Thermocouples with Full Length Double Ceramic Protecting Tubes
Base Metal Thermocouples with Full Length Ceramic Protecting Tubes
Noble Metal Thermocouples with Full Length Ceramic Protecting Tubes
Molten Metal Thermocouples
Portable Molten Aluminum Thermocouple
Sulphuric Acid Pickling Tank Thermocouple

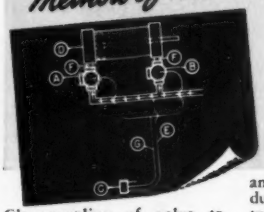
In addition to a variety of thermocouple assemblies the Brown Line includes a wide range of thermocouple elements, terminal blocks, metal and ceramic protecting tubes, insulators, thermocouple wire and extension leadwire.

It will pay you to *standardize on Brown pyrometer supplies.* Call in your local Brown engineer, today . . . for a discussion of your needs, or write for Catalog 100-2.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
BROWN INSTRUMENTS DIVISION
4461 Wayne Ave., Philadelphia 44, Pa.
Offices in principal cities of the United States, Canada and throughout the world

Honeywell *Advanced Instrumentation* FOR BETTER PROCESSING BROWN INSTRUMENTS

How to Boost Production with new Method of Mounting Ross Valves



★ Faster Machine Speeds
★ Less Air Consumption
★ Economical Installation
★ Easier Operation

Close-coupling of valve to cylinder! That's the story behind the remarkable success of the *new Ross In-Line Master Valve.*

Users claim several important advantages. By placing the master valves (A & B) at the cylinder (D), air supply and exhaust are speeded up appreciably. This in turn permits faster movement of the cylinder piston and materially increases production.

At the same time, the close coupling means that two lengths of large diameter piping between valve and cylinder – pipes continually filled and exhausted with non-productive air—are replaced by two short connecting pipes (F). The resultant saving in air with every movement of the piston considerably reduces operating costs.

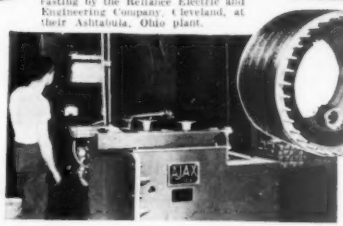
Operation is by a small, conveniently located 3-way pilot valve (C). It is supplied through tubing (E) and connected to the master valves by tubing (G). It may be mechanically, manually or electrically controlled. Hand or foot operation is greatly facilitated by the use of the smaller, more easily actuated pilot model.

For complete details, ask for Bulletin No. 302.

ROSS OPERATING VALVE COMPANY
120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

AJAX SOLVES THE PROBLEM!

Right: Thirty-inch Aluminum Rotor casting by the Reliance Electric and Engineering Company, Cleveland, at their Ashtabula, Ohio plant.



Ajax 60 KW. Twin-coil Stationary Induction Furnace at Reliance.

AJAX ELECTRIC INDUCTION FURNACE HELPS INCREASE ALUMINUM ROTOR CASTING EFFICIENCY

The Ajax-Tama-Wyatt Induction Furnace at the Reliance plant plays a major part in their successful large scale production of Aluminum Rotor Castings.

The Ajax-Tama-Wyatt Electric Induction Furnace used for melting the metal preparatory to casting, is lined with a special composition to avoid contamination of high purity aluminum with silicon or iron. Temperature control of the molten metal to within one per cent or less is another advantage of this furnace.

From 30 to 40 per cent less floor space is required for the Ajax-Tama-Wyatt Electric Induction Furnace than is required for any other. There are no fumes—shops are cooler. Operation is almost silent—working conditions are better. You'll have better labor relations, and more efficient operation through greater shop comfort when you install Ajax Induction Furnaces. Available in a wide range up to 1,000 KW., 20,000 pound capacity.

Ajax Engineers have been the pioneers in Induction Furnaces for all metals since 1917. For technical details and full information contact:

AJAX ENGINEERING CORPORATION
Trenton 7, N. J.

AJAX TAMA WYATT INDUCTION MELTING FURNACE

AJAX METAL COMPANY, AJAX ELECTROTHERMIC CORP., AJAX ELECTRIC CO., INC., AJAX ELECTRIC FURNACE CORP.

How does Foamglas improve plant operation?

It helps control plant climate permanently

● It takes a really rugged material to do a truly permanent insulating job. For, in many plants, high humidities, corrosive fumes, acid atmospheres and other destructive elements make short work of most organic, fibrous and granular materials.

But PC Foamglas, since it is a true glass in cellular form, is fireproof, vaporproof, acidproof, and verminproof. With it you need not fear costly repairs, maintenance or replacements. Foamglas retains its original insulating efficiency *permanently*, when installed according to our recommendations and specifications.

On roofs and in floors, walls and ceilings of all sorts of plants, Foamglas withstands humidity, helps to maintain desired temperature levels, thus minimizes condensation, prevents sweating. That means greater comfort for workers, less damage to goods in process, trouble-free operation of precision machines over longer periods.

Our insulating engineers will be glad to consult with you, to determine where and how you can use PC Foamglas to your best advantage for both normal and low temperature applications. Meanwhile, look over our booklets on the general use of Foamglas. Just mail the convenient coupon and we shall be glad to send you free copies.

This is FOAMGLAS®

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, water, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain inert air, lies the secret of the material's permanent insulating efficiency.

For additional information see our inserts in Sweet's Catalogs

Pittsburgh Corning Corporation
Dept. H-69, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation, your FREE booklets on the use of PC Foamglas Insulation as checked below:

Normal Temperature: Roofs ☐ Walls ☐
Floors ☐ Refrigerated Structures: ☐

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Address.....

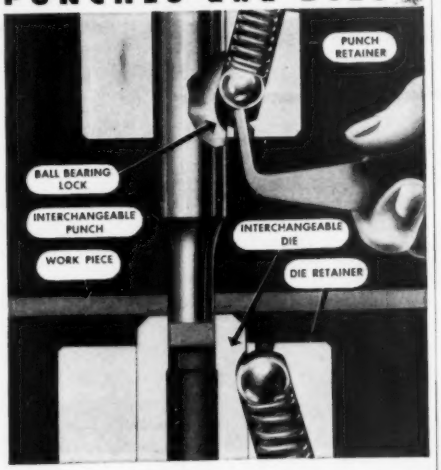
City.....State.....

PITTSBURGH PC CORNING

FOAMGLAS INSULATION

... when you insulate with FOAMGLAS... you insulate for good!

R-B INTERCHANGEABLE PUNCHES and DIES



are *Simple,* TROUBLE-FREE *in* DESIGN *and* CONSTRUCTION

Any press operator can quickly and easily install and remove R-B punches and dies. Once inserted, however, they are securely locked vertically and radially by ball bearing locks for trouble-free performance on the press. Precision-made for perfect alignment and complete interchangeability, R-B punches and dies save time and money in die-building, reduce press "down-time" materially, and unlike most die-making parts, have a salvage value.

R-B interchangeable punches and dies of standard sizes, shapes and materials can be delivered immediately. Special punches and dies, with or without the interchangeable feature, are made promptly to your specifications.

GET THE WHOLE STORY IN THIS FREE CATALOG

A 48-page book containing full information on Allied's "one stop" service. Write for your copy.

ALLIED PRODUCTS CORPORATION

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CASE REPORT No. 53 from a series of actual cases recording the successful application of "BEAR" DY-NAMIC BALANCING to industry

High Speed Centrifugals DY-NAMICALLY BALANCED

ACCURACY demanded for BIRD CENTRIFUGAL FILTERS

BIRD MACHINE CO., SOUTH WALPOLE, MASS., reports: "Bird Centrifugal Filters are used in practically every industry where it is necessary to separate solids from liquids. These machines can handle solids as fine as a fraction of a micron, or tonnages as high as 60 tons per hour ... they must be **precision-built.** All rotating parts are Dy-Namically Balanced on our 'Bear' Machine Model 400-R. In some parts up to 25 lbs. of unbalance are indicated, but the 'Bear' Machine attains both Dy-Namic and Static Balance in one quick, simple operation. Using the 'Bear' Method, we obtain accurate results as well as efficient production."

Here, the operator is adjusting the micrometer dial of the "Bear" Machine at Bird Machine Co. in order to determine the amount of Dy-Namic and Static Unbalance.

"BEAR" METHOD

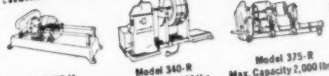
- **Improves Performance**
- **Speeds Up Production**
- **Sells MORE of YOUR Products**

The "Bear" Method of Dy-Namic Balancing is making its weight felt in every phase of industry by helping to increase sales appeal and adding value to hundreds of products ... from tiny electric motors to washing machines and railroad wheels. By the revolutionary "Bear" Method, both Dy-Namic and Static Balance are attained in one time-saving, efficient operation. The Dy-Namic Balancing operation need not interrupt or slow down routine production and may be installed with low initial capital investment.

Investigate the many production advantages and sales gains made possible by "Bear" Dy-Namic Balancing—

GET ALL FACTS in this **FREE** 22-pg. DY-NAMIC BALANCING MANUAL. Write "Bear" Mfg. Co., Dept. F-1, Rock Island, Ill.

THERE'S A "BEAR" MACHINE TO FIT YOUR NEEDS!

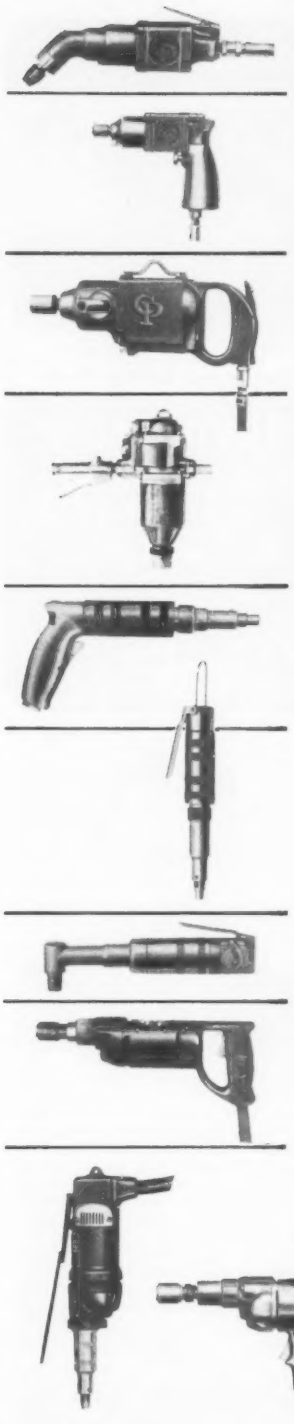


Model 337-V Max. Capacity 6 lbs. | Model 340-R Max. Capacity 100 lbs. | Model 375-R Max. Capacity 2,000 lbs. | (See Dy-Namic Balancing Manual for other models)

9051

"BEAR" STATIC AND DY-NAMIC BALANCING MACHINES

Trade Mark Registered U. S. Patent Office



To speed production line or assembly work, Chicago Pneumatic offers the world's most complete range of screw-driving and nut-running tools . . . to handle anything from #4 screws to 2" bolt size nuts. Complete line of handle types and angle heads available.

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Screw Drivers and Impact Wrenches

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Screw Drivers and Nut Runners
220-volt, 3-phase, 360-cycle A.C.

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Screw Drivers and Nut Runners
220-volt, 3-phase, 180-cycle A.C.

From their experience with such a wide range of equipment, CP representatives are in a position to recommend the most suitable type of tool for each specific job. Write for detailed information.

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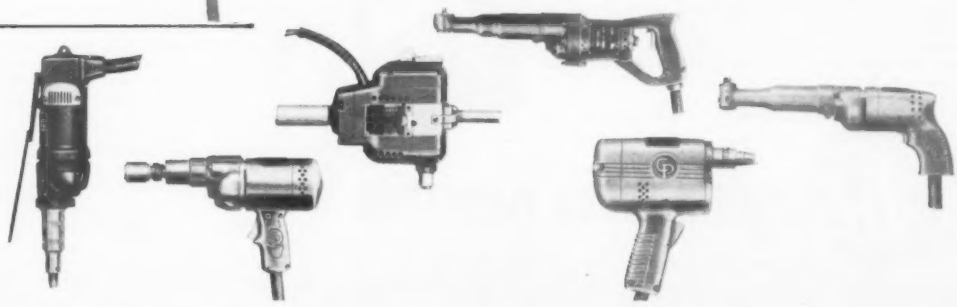
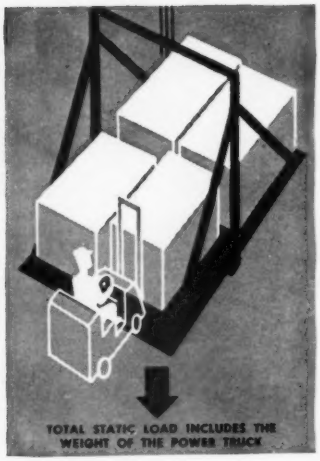
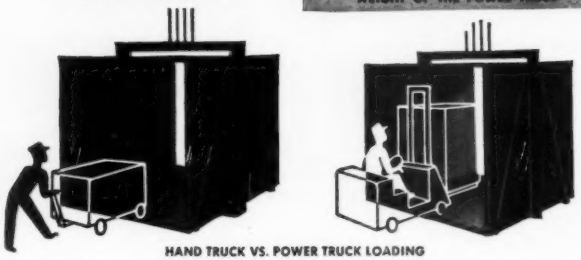


50% greater static load





HAND TRUCK VS. POWER TRUCK LOADING

ON POWER TRUCK FREIGHT ELEVATORS. Watch the front wheels of a power truck as it deposits its final pay load in the elevator. They usually stop at the outer edge of the elevator platform. This adds the weight of the power truck, some 8,000 pounds or more, to the full pay load. This extra weight, which is not present in hand truck loading, may amount to 50% or more of the full pay load. It heavily increases the static load the elevator must withstand.

Obviously, power truck freight elevators must be specifically designed—*to withstand the 'punishment' of extra static loading.* That's one of several good reasons why you should change your thinking about freight elevators when you change from hand truck to power truck loading.

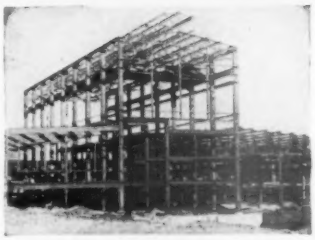
FREE! OTIS Bulletin 705 explains what happens when a power truck 'punishes' a freight elevator with extra static loading . . . off-balance loading . . . and impact loading. It shows how OTIS Pow-R-Truck Freight Elevators, with lifting capacities from 8,000 to 20,000 pounds and over, meet these severe stresses. And it also gives platform dimensions and hoistway requirements. Write for your copy. Otis Elevator Company, 260 Eleventh Avenue, New York 1, N. Y.

STANDARDIZED

POW-R-TRUCK ELEVATORS

DESIGNED TO TAKE POWER TRUCK 'PUNISHMENT'

Another IRVINGTON JOB



Structural Steel for Continuous Casting Plant.

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Inquiries Invited

G. R. Price, Maintenance Superintendent of Zenith Radio Corporation, Chicago, Illinois, has joined the thousands of other manufacturers who have improved comfort and health conditions in their plants by installing Herman Nelson Propeller Fans. Installations in the Zenith plant are typical of others all over America. From coast to coast, industrial firms are selecting Herman Nelson Propeller Fans to improve working conditions and speed up production at minimum cost. If you have a ventilating problem, write for the booklet, "1001 Ventilating Problems Solved."

Herman Nelson Propeller Fans

THE HERMAN NELSON CORPORATION
MOLINE, ILLINOIS

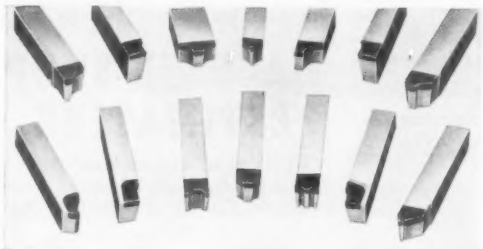
How "Triple C" Plan Helps Federal-Mogul Corporation Maintain Leadership

J. L. Wood, Plant Manager of the Detroit Branch, Federal-Mogul Corporation, manufacturers of bearings noted for exceptional precision and quality, says: "A Coordinated Carbide Control program is important to the maintenance of an advantageous position in a highly competitive field."

A PIONEER in various forms of efficiency in quality production, Federal-Mogul is one of many large companies who are using Carboloy's "Triple C" plan of coordinated carbide control to help beat the trend towards high break-even points caused by rising costs.

Essentially, the plan is one of coordination of *all phases* of carbide use within a plant, under the direct supervision of a *carbide supervisor.*

Under the "Triple C" plan, design, application, and maintenance of carbide tools are standardized wherever possible; grinding, purchasing, inventory control, and handling are coordinated by a carbide coordinator.



Under "Triple C", Federal-Mogul has developed 3500 form tools. Of these 80% are ground from six inexpensive standard Carboloy single-point tools and one standard blank! The seven standards are shown below; above are a few of the form tools developed from them.

Here are a few of the benefits reported by Federal-Mogul:

Advantages of central responsibility:

- Greater utilization of carbide tools
- Organized training of personnel in carbide methods
- Immediate, expert assistance with carbide problems
- Constant inspection of carbide tools by carbide specialists
- Recognition of causes of poor performance or carbide breakage

Advantages of central stock:

- Drastically reduced carbide tool inventory
- Extensive standardization of carbide tools
- More efficient salvage and re-use of worn or broken tools
- Greater economies in special tools

Advantages of central grinding:

- Less grinding equipment needed
- Lower inventory of expensive grinding wheels
- Expert, specialized grinding of *all* carbide tools
- Longer carbide tool life
- Elimination of grinding by machine operators
- Less idle machine time

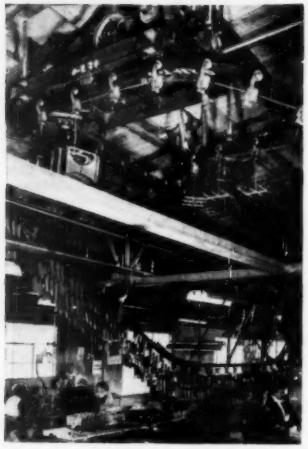
These benefits are *typical.* Wherever the plan has been adopted, similar savings in time and costs have been achieved . . . plus, of course, the amazing increases in production that extensive use of carbides brings to any manufacturing operation! The odds are ten to one that the plan can do as much for your company.

CARBOLOY COMPANY, INC.
11135 E. 8 Mile Avenue, Detroit 32, Michigan

CARBOLOY®
CEMENTED CARBIDE

COORDINATED CARBIDE CONTROL
THE CARBOLOY "TRIPLE C" PLAN
FOR EVEN GREATER SAVINGS WITH CARBIDES

...ABOVE ALL Buschman Cable Trolley Conveyors reduce your handling costs



Buschman Cable Trolley Conveyors put your overhead space to work for you . . . reducing overhead . . . bringing costs down. In leading plants these Universal Cable Conveyors have proved to be *the* low-cost, durable and efficient method of handling light to medium loads. Easily installed or altered to meet changing conditions. Write for Bulletin 40.

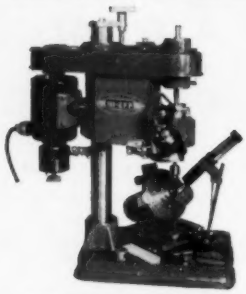
STANDARD STOCK UNITS
Smooth Running, Trouble-Free Installation

TROLLEYS (Pat. Pending). Have split driving lug castings bolted to all steel cable, with channel brackets and ball bearing wheels. TROLLEYS rated up to 160-lb. capacity spaced on 12" centers. Track 3" T. JR. with hanger lugs for bolted supports, dowel pinned joint.

THE E. W. BUSCHMAN CO.
4425 Clifton Ave. Cincinnati 32, Ohio

Buschman Conveyors

SENSITIVE DRILLING MACHINE



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★ SIMPLE DESIGN
★ SPEEDS TO 40,000 R.P.M.
★ .0001" RUN OUT
★ HOLES TO .002" DIAMETER
★ VARIABLE SPINDLE SPEED
★ 10 STANDARD MODELS

Write for Bulletin No. 752

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PRECISION DRILLING MACHINES

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3 1 7

Help your shop stabilize profits — increase your own worth — by learning

How to estimate the time any machining job will take

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop—large or small. Whether a job involves drilling, boring, tapping threading, grinding — or any of the scores of other operations — this handy manual tells you exactly what to consider in estimating job-time. It covers every step —from setting up the job, to tearing it down — giving reasonable time values for each, based on actual experience. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating specific jobs on each type of machine in use today.

Examine For 10 DAYS FREE

MACHINE-SHOP ESTIMATING

By W. A. NORDHOFF
Douglas Aircraft Company

486 pages, 5¼ x 8¼, 486 illustrations, $6.00

This book sets down the principles of machine-shop estimating so clearly and concisely that you can put them to use immediately. It teaches you step-by-step how to estimate the time it takes to manufacture specific machined parts, classifying every fabrication job into machining and handling operations. It supplies self-explanatory breakdowns of all the elements of each operation and gives the time value established for each. These time values are usually presented in decimal minutes still are carried out to three places. In addition the book includes: sample estimates for each operation described, tables of variables and constants, and 22 typical problems to assist you in making your own estimates accurately and speedily. 486 illuminating charts, diagrams, tables and photographs are supplied to illustrate the topics discussed.

Tells you how to make estimates on such operations as:

—boring
—counterboring
—spot drilling
—facing
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—straddle milling
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—and scores of others

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Regardless of what your requirements in enclosed gear drives may be, the Foote Bros. line includes drives exactly suited to any application.

Foote Bros.' manufacturing experience goes back nearly a century, and Foote Bros.' large plants include the newest in equipment for the production of highest quality gearing. Check with the Foote Bros. representative near you for drives suited to your needs.

FOOTE BROS. HYPOWER ENCLOSED GEAR DRIVES

A complete line of worm gear drives that assures economy in original cost and in operation. They are extremely compact in design and possess greatly increased thermal capacity. Available in both horizontal and vertical types.

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This complete line of enclosed worm gear drives has been newly engineered and offers the maximum in rugged dependability. Available in a wide range of ratios in both horizontal and vertical types.

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Helical gear drives available in single, double and triple reductions in sizes and ratios to meet practically any requirement for a high quality helical gear unit. This newly engineered line of enclosed gear drives represents the last word in power transmission equipment.

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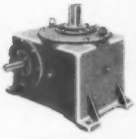
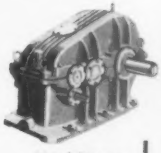
This new line of compact drives will shortly be introduced. Small in size, light in weight—they will meet many industrial applications.

Hypower Horizontal



Hygrade Vertical

Hygrade Top Hat



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The time saved by stock clerks in locating and issuing tools is at least 75%. Floor space is reduced up to 50%. Overcrowding which formerly existed was eliminated and future expansion is amply provided for. All tools are stored within easy reach; the need for ladders eliminated.

Tools are no longer lost or damaged in storage. Lines of mechanics do not form at the window.

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Continuous, up-to-the-second individual count of PRODUCTION from hundreds of machines or operations right in the Production Control Office. Check idle machines or time study any number of operations unobserved. Totalize and compare output from hundreds of machines in minutes. Wizard Electric Counters panel mounted in compact self-supporting cabinet assemblies. Count anything that will operate electric switch or photo electric unit. Send for Bulletin PEC-40.

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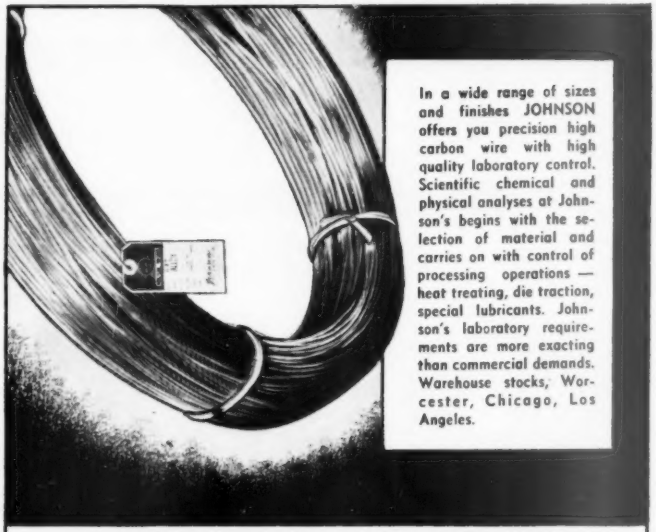

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Worthington Rotary Pump—displacements to 56 gpm, pressures to 100 psi.

With the broadest line of standard pumps—centrifugal, power, rotary, steam—and the longest experience in the field, Worthington is your best bet for a pump that will meet your requirements exactly. Not merely a pump with the desired capacity and head, but a pump built in every detail to do *your* kind of work efficiently and economically.

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PRODUCTION, MAINTENANCE AND LABOR SUBJECTS

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FACTORY MANAGEMENT AND MAINTENANCE

WHAT TO LOOK FOR IN U. S. MATCHLESS PACKING

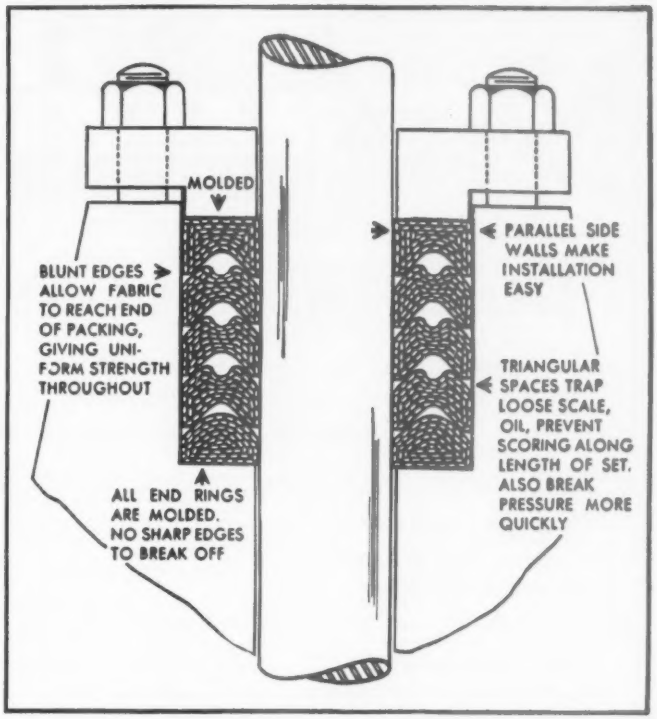
BLUNT EDGES—Give more efficient shape; allow fabric to reach end of packing, providing uniform strength throughout. In conventional packing (feather-edge design) fabric cannot be forced into sharp edge, leaving unprotected soft-rubber end to cause curling and chipping.

TRIANGULAR SPACES—Blunt edges provide triangular spaces for trapping loose scale, oil, etc. Result is lower coefficient of friction, less power required, and scaling does not score entire length of packing set.

PRESSURE BREAK—The triangular space of each ring breaks the pressure more quickly than ordinary types without this feature. With U. S. Rubber Matchless Packing design, automatic action is faster, more effective.

MOLDED END RINGS—Tests show the female ring and the one next to it take 70% of the pressure on the set. In Matchless, *all* rings are molded, are of proper density, and have no sharp edges to break off, as on end rings cut from slab.

EASY TO INSTALL—Matchless Packing has parallel side walls, while conventional packings are made with varying degrees of wall flare. Matchless rings slide easily into stuffing box; the flare type requires considerable effort and time.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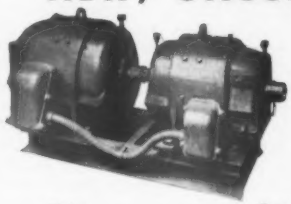

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Volts—120 D.C.
Amperes—18
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Index To Advertisements

Abrasive Products, Inc. 296
Acme Steel Corporation 156
Adam Electric Co., Frank 157
Air Express Div., Railway Express 206
Ajax Engineering Corp. 304
Ajax Flexible Coupling Co. 298
Allegheny-Ludlum Steel Corp. 201
Allen-Bradley Company Ins. 48, 49
Allen Co., L. B. 316
Allied Products Corporation 306
Allis-Chalmers Mfg. Co. 9, 22, 23, 38, 39, 143
Aluminum Company of America 203, 271
Alvey-Ferguson Company 232
American Air Filter Co. 182
American Blower Co. 275
American Brake Shoe Co. (National Bearing Division) 41
American Brass Company 262
American Gas Association 322
American Hoist & Derrick Co. 160
American Hot Dip Galvanizers Assn., Inc. 168
American Lumber & Treating Co. 260
American Monorail Company 175
American Mutual Liability Insurance Co. 26, 27
American Optical Company 133
American Pulley Company 297
American Screw Company 17
American Structural Products Co. 33, 285
Anaconda Copper Mining Co. 177
Anchor Post Fence Div., Anchor Post Products, Inc. 40
Anti-Corrosive Metal Products Co., Inc. 202
Appleton Electric Company 208
Arco Company 258
Aro Equipment Company 154
Atlas Floor Surfacing Machinery Co. 314
Automatic Transportation Company 15

Baker-Raulang Company 7
Bausch & Lomb Optical Co. 256
Bear Mfg. Co. 306
Benjamin Electric Mfg. Co. 289
Binks Manufacturing Co. 234, 280
Black, Sivalls & Bryston 261
Blackhawk Mfg. Co. 42
Blanchard Machine Company 221
Brooks Equipment & Mfg. Co. 57
Brown Instrument Div., Minneapolis Honeywell Regulator Co. 304
Brown & Sharpe Mfg. Co. 215
Bruning Company, Inc., Charles 152
Buckeye Tools Corporation 32D
Buell Engineering Co., Inc. 204
Buffalo Fire Appliance Corp. 230
Bull Dog Electric Products Co. 20, 21
Bunting Brass & Bronze Company 209
Buschman Co., E. W. 310
Byers Machine Company 276

Cambridge Wire Cloth Co. 218
Carboloy Company, Inc. 309
Carey Mfg. Co., Philip 44, 45
Century Electric Company 147
Chain Belt Company 139
Chicago Metal Hose Corp. 290
Chicago Pneumatic Tool Co. 307
Cities Service Oil Co. 273
Clark Controller Company 167
Clark Equipment Company (Industrial Truck Division) 28, 29
Cleveland Cap Screw Co. 150
Cleveland Crane & Engineering Co. 269
Cleveland Twist Drill Co. 189
Cone Automatic Machine Co., Inc. 56
Coppus Engineering Corp. 199
Crane Company 55
Crawford Door Company 274
Crescent Insulated Wire & Cable Co. 184
Crescent Truck Company 250
Crocker-Wheeler Electric Mfg. Co. 24, 25
Curtis Pneumatic Machinery Co. 249

Darnell Corporation 164
Day-Brite Lighting Co., Inc. 36
Dayton Rubber Company 34, 35
De Laval Steam Turbine Co. 292
Delta Manufacturing Co. 213
Detroit Steel Products Co. 241
De Vilbiss Company 219
Dings Magnetic Separator Co. 270
Dolge Co., C. B. 296
Dow Chemical Company 174, 263
Dracco Corporation 212
DuPont de Nemours & Co., E. I. (Rayon Cordura) 255
Durant Mfg. Co. 298

Eagle-Picher Company 151
Eastman Kodak Company 265
Edison Storage Battery Div. of Thomas A. Edison Co. 300
Electric Controller & Mfg. Co. 244
Electric Industrial Truck Assn. 257
Electric Storage Battery Co. 131
Electro-Dynamic Div., Electric Boat Co. 193
Electro Rust-Proofing Corp. 200
Elwell-Parker Electric Co. 10

Factory Management & Maintenance 317
Fairbanks-Morse & Company 6
Felters Company 259
Finnell Systems, Inc. 227
Foote Bros. Gear & Machine Corp. 311
Fostoria Pressed Steel Co. 279
Frasse & Co., Inc., Peter A. 253
Frick-Gallagher Co. 312
Frigidaire Div. of General Motors 14
Fulton-Sylphon Div., Robertshaw-Fulton Control Co. 284

Gates Rubber Company 191
General Box Company 190
General Electric Company (Apparatus Dept.) 30, 31, 268
General Electric Company (Commercial Appliances) 210
General Electric Co. (Electronics Dept.) 16
General Electric (Lamp Dept.) 60
General Electric Co. (Construction Materials Dept.) 161, 211, 303
General Gas Light Co. 264
Gerrard Steel Strapping Div. 302
Goodrich Co., B. F. 1
Goodyear Tire & Rubber Company 37
Gorman-Rupp Company 268
Grant Gear Works 301
Grinnell Company 225
Gulf Oil Company 165

Hamilton Tool Co. 248
Harnischfeger Corporation 153, 205
Harper Co., H. M. 229
Harrison Radiator Div., General Motors Corp. 231
Hein-Werner Corporation 238
Hewitt Rubber Div., Hewitt-Robins, Inc. 267
Hinde & Dauch Paper Co. 4
Hines Lumber Co., Edward 224
Hood Rubber Company 168
Howell Electric Motors Company 277
Hyatt Bearings Div., General Motors Corp. 135

Independent Pneumatic Tool Co. 293
Industrial Brownhoist Corp. 291
Industrial Control Div., Square D Company 63, Third Cover
Inland Steel Company 192
International Nickel Co., Inc. 295
Invincible Vacuum Cleaner Co. 163
Irvington Steel & Iron Works 308

Jeffrey Mfg. Co. 245
Jenkins Bros. 169
Johns-Manville Co. 32, 188
Johnson Bronze Company 196
Johnson & Son, Inc., S. C. 149
Johnson Steel & Wire Co., Inc. 312
Jones Foundry Co., Inc., W. A. 171
Jones & Lamson Machine Co. 222

Keasbey & Mattison Co. 62
Keller Tool Company 281
Kester Solder Company 158
Kex National Service, Inc. 220
Kidde & Company, Inc., Walter 43
Kimberly-Clark Corporation 301
Kinnear Manufacturing Co. 194
Koppers Company, Inc. 58

Lamson & Sessions Company 207
Lincoln Electric Company 155
Lincoln Engineering Co. 287
Link-Belt Company 8
Lukenweld Div., Lukens Steel Co. Ins. 16B
Lunkenheimer Company 176

Mahon Company, R. C. 233
Manheim Manufacturing Co. 181
Manning, Maxwell & Moore, Inc. 200
Marsh Stencil Machine Co. 316
Master Electric Company ..... Fourth Cover
McCaskey Register Company 146
McGraw-Hill Book Co. 310
Mercury Mfg. Co. 236
Midland Industrial Finishes Co. 272
Minneapolis-Moline Power Implement Company 280
Mobilift Corporation 240
Morse Chain Company 288

National Electric Products Co. ..... Second Cover
National Screw & Mfg. Co. 246
National Supply Co. (Spang-Chalfant Div.) 197
Nelson Corp., Herman 308
Norton Company 145

Ohio Injector Company 51
Orangeville Mfg. Co. 316
Osborn Manufacturing Co. 12
Otis Elevator Co. 308
Owens-Corning Fiberglas Corp. 54
Ozalid Div., General Aniline & Film Corp. 198

Pangborn Corporation 180
Parker-Kalon Corp. 282
Photoswitch, Inc. 314
Pick Co., Inc., Albert 184
Pittsburgh-Corning Corporation 305
Pittsburgh Plate Glass (Brush Div.) 185
Pittsburgh Plate Glass (Paints) Ins. 16A
Pittsburgh Steel Products Co. 296
Pittsburgh Valve & Fittings 59
Pratt & Whitney, Div. Niles-Bement-Pond Company 235
Precise Products Co. 302
Production Instrument Company 312
Protectoseal Co. 162
Proto Tools 5

Quaker Rubber Corporation 173

Railway Express Agency 226
Raybestos-Manhattan, Inc. (Manhattan Rubber Div.) 251
Redington Co., F. B. 248
Republic Steel Corporation 216
Reynolds Metal Co. 48
Rivett Lathe Grinder, Inc. 168
Robertson Co., H. H. 53
Roebling's Sons Co., John A. 283
Roots-Connersville Blower Corp. 141
Ross Operating Valve Company 304
Ryerson & Son, Joseph T. 2

Safety & Maintenance Co., Inc. 266
Schramm, Inc. 166
Shell Oil Company 179
Simonds Saw & Steel Company 13
Skilsaw, Inc. 159
Smith Corporation, A. O. 237
Smooth Ceilings System 228
Snap-on Tools Corporation 214
Spang-Chalfant Div. National Supply Co. 197
Square D Company ..... 63, Third Cover
Standard Conveyor Company 170
Standard Oil Company (Indiana) 247
Standard Pressed Steel Co. 294
Stemco Corporation 172
Sterling Electric Motors 223
Stewart Iron Works Co. 200
Stoner Mfg. Corp. 186
Stonhard Company 321
Stuart Oil Co., Ltd., D. A. 300

Taylor Company, Halsey W. 228
Taylor Dynamometer & Machine Co. 310
TelAutograph Corporation 137
Temprite Products Corp. 242
Tennant Co., G. H. 254
Texas Company 64
Thermoid Rubber Company 195
Thew Shovel Co. 286
Thomas Flexible Coupling Co. 144
Tinnerman Products, Inc. 217
Toledo Scale Company 148
Tomkins-Johnson Company 252
TopFlight Tape Co. 316
Towmotor Corporation 46
Townsend Company 187
Trane Company 272
Truck-Man, Inc. 298
Trumbull Electric Manufacturing Co. 47

Udylite Corporation 239
United States Gauge Div., American Machine & Metals, Inc. 299
U. S. Gutta Percha Paint Co. 19
United States Rubber Company 50, 315

Valley Electric Corporation 272
Van Dorn Electric Tool Co. 32A
Veeder-Root, Inc. 11

Wagner Electric Company 52
Wayne Pump Company 49
Webb Co., Jerris B. 178
Westinghouse Electric Corp. 183, 32B, 32C
Willson Products, Inc. 278
Worthington Pump & Machinery Corp. 18, 313
Wright Hoist Div. (American Chain & Cable) 243

Yale & Towne Mfg. Co. 61
Young Radiator Co. 234

■

INDUSTRIAL CONSULTANTS 316

■

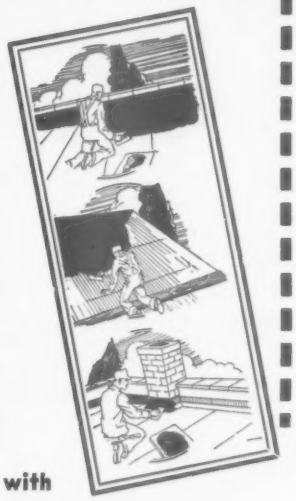
SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 318
Selling Opportunities Offered 318
Positions Wanted 318
Selling Opportunities Wanted 318
Employment Services 318
SPECIAL SERVICES
Rebuilding 318
Repairing 318
EDUCATIONAL
Schools 318
BUSINESS OPPORTUNITIES
Offered 318
PROPERTY
For Sale 318
EQUIPMENT
(Used or Surplus New)
For Sale 319
WANTED
Equipment 319

STOP LEAKS..

on any type roof



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Seamless Tubing Production Line at

THE BABCOCK & WILCOX TUBE COMPANY

Demonstrates Advantages of Speed-Heating with GAS

CONTINUOUS REHEATING of seamless tubing, at production speeds integrated with piercing-mill and sizing-mill capacities, demonstrates some of the important advantages of high-speed heating with GAS.

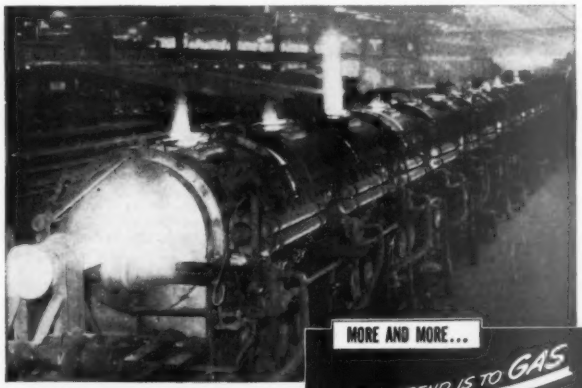
Many types of carbon, alloy and stainless steels are used in the manufacture of seamless tubing at The Babcock & Wilcox Tube Company. During the early stages of tube formation the tubes drop in temperature before entering the sizing mill. The modern Gas-fired units in the Beaver Falls, Pennsylvania, plant perform this reheating operation at speeds up to 162 FPM for 6-inch tubing.

Another important factor is the precise temperature control which permits adjustment of production speeds to compensate for delivery from the rolling mill or the requirements of the sizing mill. In addition, the automatic controllability of GAS permits immediate adjustment of temperatures for any type of alloy tubing.

Some of the results, attributed to this high speed GAS heating system by production executives of The Babcock & Wilcox Tube Company include—

- **fuel costs for reheating reduced 63% per ton**
- **output increased over 10% per hour**
- **product improved by absolute uniformity of heating**
- **maintenance costs reduced due to equipment simplicity**

The versatility of GAS for high-speed heating has been demonstrated in all type of production operations. It's always well to keep in touch with the latest developments in effective utilization of GAS.



Battery of twelve continuous Gas-fired Selas heating units in which seamless tubes, on way to sizing mill, are reheated from 1300F to 1900F and above.

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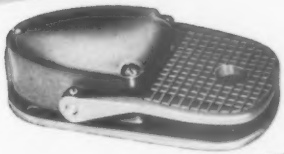
NEW HEAVY-DUTY FOOT SWITCH



Type AW Foot Switch without guard—for applications not involving hazard to operator.

Self-contained contact mechanisms are easily wired and readily replaced.

CLASS 9002
TYPE AW

- ✓ Streamlined to match modern machine styling.
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- ✓ Wide pedal, operable from three directions but protected against accidental contact or falling objects.
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- ✓ Snap action contacts, rated 600 volts pilot duty, A. C. or D. C.
- ✓ Available, with or without pedal guard, in several types.

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	Without Guard	With Guard
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Double pole, double throw	AW 3	AW 4
Two stage, each stage single pole double throw	AW 5	AW 6

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Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

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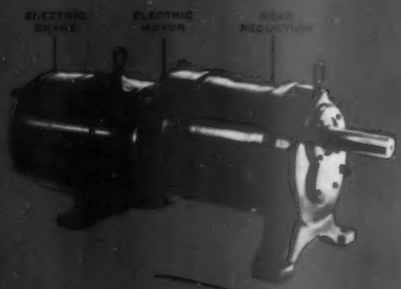

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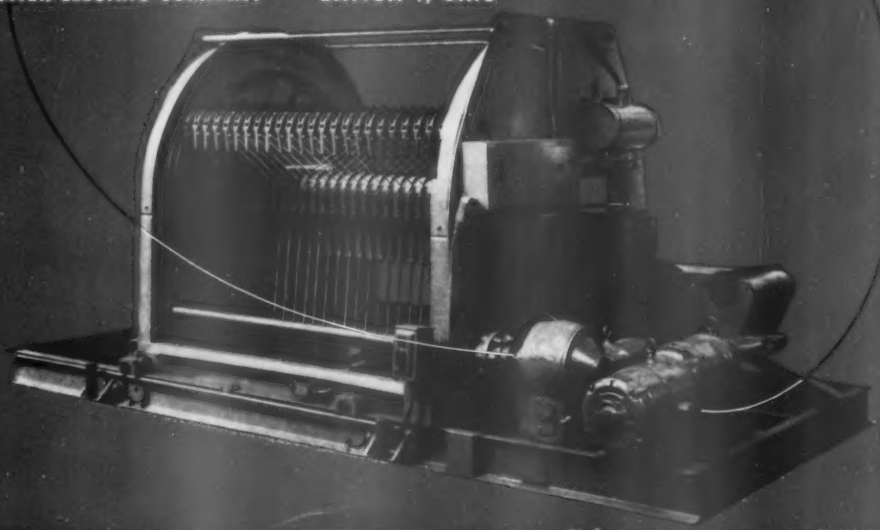
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